POWERHOUSE®

PH3100RI Digital Inverter Generator

SHOP MANUAL

Coast Distribution System
March 2014

PREFACE

This manual covers the construction, function and servicing procedure of the *POWERHOUSE*® PH3100Ri generator, certificated by CARB.

Careful observance of these instructions will result in better, safer service work.
All information, illustrations, directions and specifications included in this publication are based on the latest product information available at the time of approval for printing. Coast Distribution Systems, Inc. reserves the right to make changes without incurring any obligation whatsoever. No part of this publication may be reproduced without written permission.

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1. SPECIFICATIONS

1.1 SPECIFICATIONS

Dimensions and weights

Model	PH3100Ri
Overall Length	24 in(610mm)
Overall Width	18 in (457mm)
Overall Height	18.3 in (464mm)
Net Weight	129 lbs (59 kg)

Engine

Model	177F
Type	4-stroke,OHV, single cylinder, Gasoline engine
Displacement	270cc
Bore x stroke	77 × 58
Maximum horsepower	6.8
Compression ratio	9.2:1
Cooling system	Forced air-cooled
Ignition system	Electronic
Spark plug	F7RTC
Carburetor	Horizontal, Float type
Air cleaner	Semi-dry type
Governor	Electronic control
Lubrication system	Splash

Lube oil	SAE 10W-30/15W-30 (SF/SG grade or greater) for temps above 32 F; SAE 0W-30/0W-40 for temps below 32 F
Oil capacity	35 oz. (1.0 L)
Starting system	Remote, Electric, & Recoil
Stopping system	Primary circuit ground
Fuel used	Automotive unleaded gasoline

Alternator

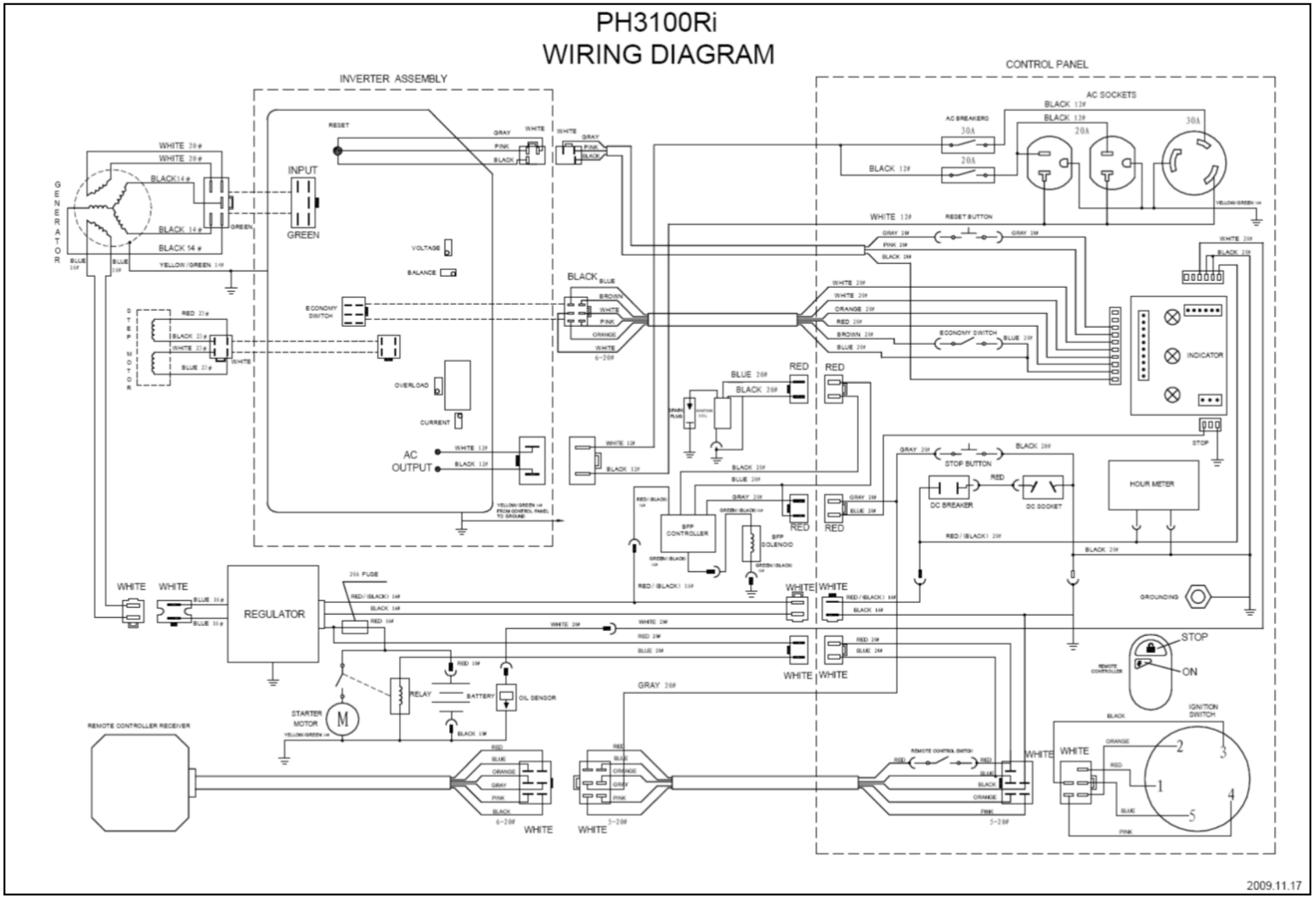
Alternator type	Multi pole rotation type
Alternator structure	Self-ventilation drip-proof type
Excitation	Self-excitation (Magnet type)
Phase	Single phase
Rotating direction	Clockwise (Viewed from the generator)
Frequency regulation	AC-DC-AC conversion (Inverter type)

1.2 CHARACTERISTICS

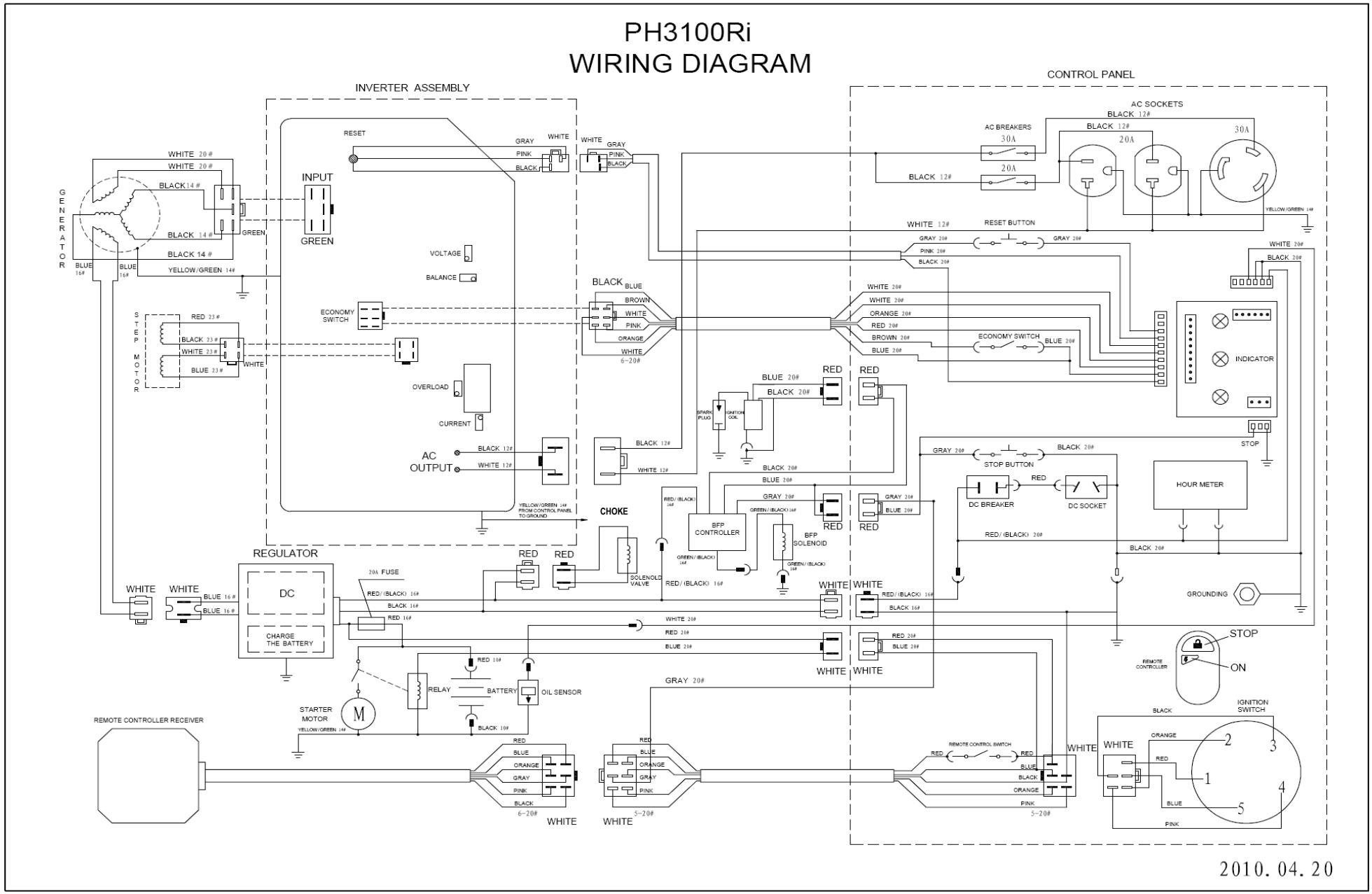
Model		PH3100Ri
Maximum output AC		3.1KW
Rated output AC		3.0KW
Rated output DC		100W
Rated frequency		60HZ
Rated voltage AC		120V
Rated voltage DC		12V
Rated current AC		25.0A
Rated current DC		8.3A
Power factor		1.0cosφ
Voltage variation rate	Momentary	10%max.
	Average	1.5%max.
	Average time	3 sec. max.
Voltage stability		±1%
Frequency variation rate	Momentary	1%max.
	Average	1%max.
	Average time	1 sec. max.
Frequency stability		±0.1%
Insulation resistance		10MΩmin.
AC circuit protector		20A and 30A (120V)

DC circuit protector	10A
Fuel tank capacity	4.4 gal (16.6L)
Continuous running time (at rated load / at ¼ load)	7.6 hours / 17.8 hours
Noise level (Zero load to full load)	56-65 dB @ 23’ (7m)

1.3 Wiring Diagram w/o electric choke solenoid



1.4 Wiring Diagram with electric choke solenoid, beginning with S/N 100602380706001



2. Service information

2.1 The importance of proper servicing

Proper servicing is essential to the safety of the operator and the reliability of the engine. Any error or oversight made by the technician while servicing can easily result in faulty operation, damage to the engine or injury to the operator.

- Improper servicing can cause an unsafe condition that can lead to serious injury or death.
- Follow the procedures and precautions in this shop manual carefully.
- Some of the most important precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing maintenance or repairs. Only you can decide whether you should perform a given task.
- Failure to follow maintenance instructions and precautions can cause you to be seriously hurt or killed. Follow the procedures and precautions in this shop manual carefully.

2.2 Important safety precautions

Be sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and safety equipment. When performing maintenance or repairs, be especially careful of the following:

- Read the instructions before you begin, and be sure you have the tools and skills required to perform the tasks safely.
- Be sure that the engine is off before you begin any maintenance or repairs. This will reduce the possibility of several hazards:

  a.) Be careful to avoid carbon monoxide poisoning from engine exhaust.

  b.) Make sure there is adequate ventilation whenever you run the engine.

  c.) Be careful to avoid burns from hot engine parts and hot exhaust.

  d.) Let the engine cool before you touch it.

  e.) Be careful to avoid injury from moving parts

- Do not run the engine unless the service manual instructs you to do so. When the engine is running, keep your hands, fingers, and clothing away from moving parts.
- To reduce the possibility of a fire or explosion, be careful when working around gasoline. Use only a nonflammable solvent, not gasoline, to clean parts. Keep all cigarettes, sparks, and flames away from fuel and all fuel-related parts.

2.3 Service rules

1. Use genuine *POWERHOUSE*® or *POWERHOUSE*®-recommended parts and lubricants or their equivalents. Parts that do not meet *POWERHOUSE*® design specifications may damage the engine.
2. Always install new gaskets, O-rings, etc. when reassembling.
3. When tightening bolts or nuts, begin with larger-diameter or inner bolts first and tighten to the specified torque diagonally, unless a particular sequence is specified.
4. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.
5. After reassembly, check all parts for proper installation and operation.
6. Many screws used in this machine are self-tapping. Be aware that cross-threading or over tightening these screws will strip the threads and damage the hole.
7. Use only metric tools when servicing this engine. Metric bolts, nuts and screws are not interchangeable with non metric fasteners. The use of incorrect tools and fasteners will damage the engine.

■ Electric precautions

1. Hold the connector body to disconnect the connector. Do not disconnect by pulling the wire harness. To disconnect the locking connector, be sure to unlock first, and then disconnect.
2. Check the connector terminals for bent pins, excessive stretching, missing terminals, or other abnormalities before connecting the connector.
3. To connect, insert the connector completely into the receptacle. If the connector is a locking type, be sure that it is locked securely.
4. Check the connector cover for cracks or other damage and make sure the connector female terminal fits snugly into the connector. Then, connect the connector securely. Check the connector terminal for rust. Remove any rust using an emery paper or equivalent material before connecting the connector.
5. Secure the harness clips in the specified locations on the frame, and clamp the wire harnesses.
6. Clamp the wire harnesses securely so that they do not interfere with rotating parts, moving parts or hot parts.
7. Route and connect the wire harnesses as shown in the service manual. Be sure that the harnesses are not loose, twisted or pulled tight.
8. Route the wire harnesses properly so that they do not contact with shape edges or corners, or the end of any bolts or screws.
9. If a wire harness contacts the end of any bolts or screws or sharp edges or corners, protect that part of the harness with a tube or by wrapping with an insulating tape. If the wire harness has a grommet, install the grommet securely.
10. Take care not to pinch the wire harnesses during installation of a part. If a wire harness has the damaged insulation, repair by winding with the electrician’s insulating tape.
11. Before using the tester, carefully read the manufacturer’s instructions and follow the instructions in this Service Manual. Be sure that the test unit’s battery is fully charged and verify that the unit is operating correctly before you begin testing.

2.4 Serial number location

The generator's engine serial number identifies your particular unit and is required when ordering parts and accessories. The generator serial number is also used by your dealer and Coast Distribution for warranty administration and must be supplied before any work can be done.

The engine serial number can be found stamped on the engine block above the oil dipstick. It is visible when the engine oil access cover is removed.

2.5 Engine maintenance standards

Part	Item		Standard	Service limit
Engine	Maximum speed without load		3600±100rpm	—
Cylinder	Sleeve I.D.		77.000-77.020mm (3.0315”-3.0323”)	77.105mm (3.0356”)
Piston	Skirt O.D		76.960-76.980mm (3.0299”-3.0307”)	76.85mm (3.0256”)
	Pin bore I.D.		18.002-18.008mm (0.7087”-0.07090”)	18.05mm (0.7106”)
Piston pin	O.D		17.994-17.000mm (0.7084”-0.7087”)	17.95mm (0.7067”)
Piston ring	1st ring	Height h	1.97-1.99mm (0.0776”-0.0783”)	1.87mm (0.0736”)
		Ring side clearance	0.02-0.06mm (0.001”-0.002”)	0.15mm (0.006”)
		Ring end clearance	0.15-0.25mm (0.006”-0.010”)	1.0mm (0.04”)
		Width t	3.40-3.60mm (0.134”-0.142”)	3.20mm (0.126”)

2.5 Engine maintenance standards, (continued)

Part	Item		Standard	Service limit
Piston ring (continued)	2nd ring	Height h	1.97-1.99mm (0.0776”-0.0783”)	1.87mm (0.0736”)
		Ring side clearance	0.02-0.06mm (0.001”-0.002”)	0.15mm (0.006”)
		Ring end clearance	0.15-0.25mm (0.006”-0.010”)	1.0mm (0.04”)
		Width t	3.40-3.60mm (0.134”-0.142”)	3.20mm (0.126”)
	Oil ring	Height h	3.40-3.60mm (0.134”-0.142”)	3.20mm (0.126”)
		Ring side clearance	0.03-0.18mm (0.001”-0.007”)	0.24mm (0.009”)
		Ring end clearance	0.20-0.50mm (0.008”-0.020”)	1.0mm (0.04”)
		Width t	2.3-2.7mm (0.09”-0.11”)	2.2mm (0.087”)
Connecting rod	Small end I.D		18.006-18.017mm (0.7089”-0.7093”)	18.08mm (0.7118”)
	Big end I.D		33.020-33.033mm (1.3000”-1.3005”)	33.09mm (1.303”)
Crankshaft	Crank pin O.D.		32.967-32.980mm (1.2979”-1.2984”)	32.90mm (1.295”)
Valves	Valve clearance	IN	0.10±0.02mm (0.004” ±.001”)	---
		EX	0.15±0.02mm (0.006” ±.001”)	---
	Stem O.D.	IN	6.465-6.480mm (0.2545”-0.2551”)	6.40mm (0.2520”)
		EX	6.455-6.470mm (0.2541”-0.2547”)	6.40mm (0.2520”)
	Guide I.D.	IN/EX	6.500-6.530mm (0.2559”-0.2571”)	6.56mm (0.2583”)
	Seat width	IN/EX	0.8mm (0.03”)	1.8mm (0.07”)
Valve spring	Free length	IN/EX	39.1mm (1.54”)	37.5mm (1.48”)
Cam wheel	Cam height		31.700-31.780mm (1.2480”-1.2512”)	31.0mm (1.2205”)
Carburetor	Main jet		0.8mm (.032”)	—
	Float height		12	—
	Pilot screw opening (Fixed)		N/A	—
Spark plug	Gap		0.6-0.7mm (0.024”-0.028”)	—
Ignition coil	Resistance	Primary side	1.4-2.0 Ω	—
		Second side	11.0-15.0kΩ	—

2.6 Motor

Part	Item	Wire color	Standard(Ω)
DC winding	Resistance	blue－blue	0.045-0.070
Sub winding	Resistance	white－white	0.100-0.160
Main winding	Resistance	black－black－black	0.250-0.350

2.7 Torque values

Item	Specification	Tightening torque	
		Lbf-ft	N·m
Connection rod bolt	M8x40	21.4-23.6	29-32
Spark plug	M12x1x13	8.9-11.0	12-15
Crankcase cover	M8x35	20.7-22.9	28-31
Flywheel nut	M16x1.5	66.4-73.8	90-100
Standard torque	M5 Bolt, nut	4.4-5.9	6-8
	M6 Blot, nut	5.9-7.4	8-10
	M8 Bolt, nut	14.8-17.0	18-22
	M10 Bolt, nut	40.6-44.3	55-60

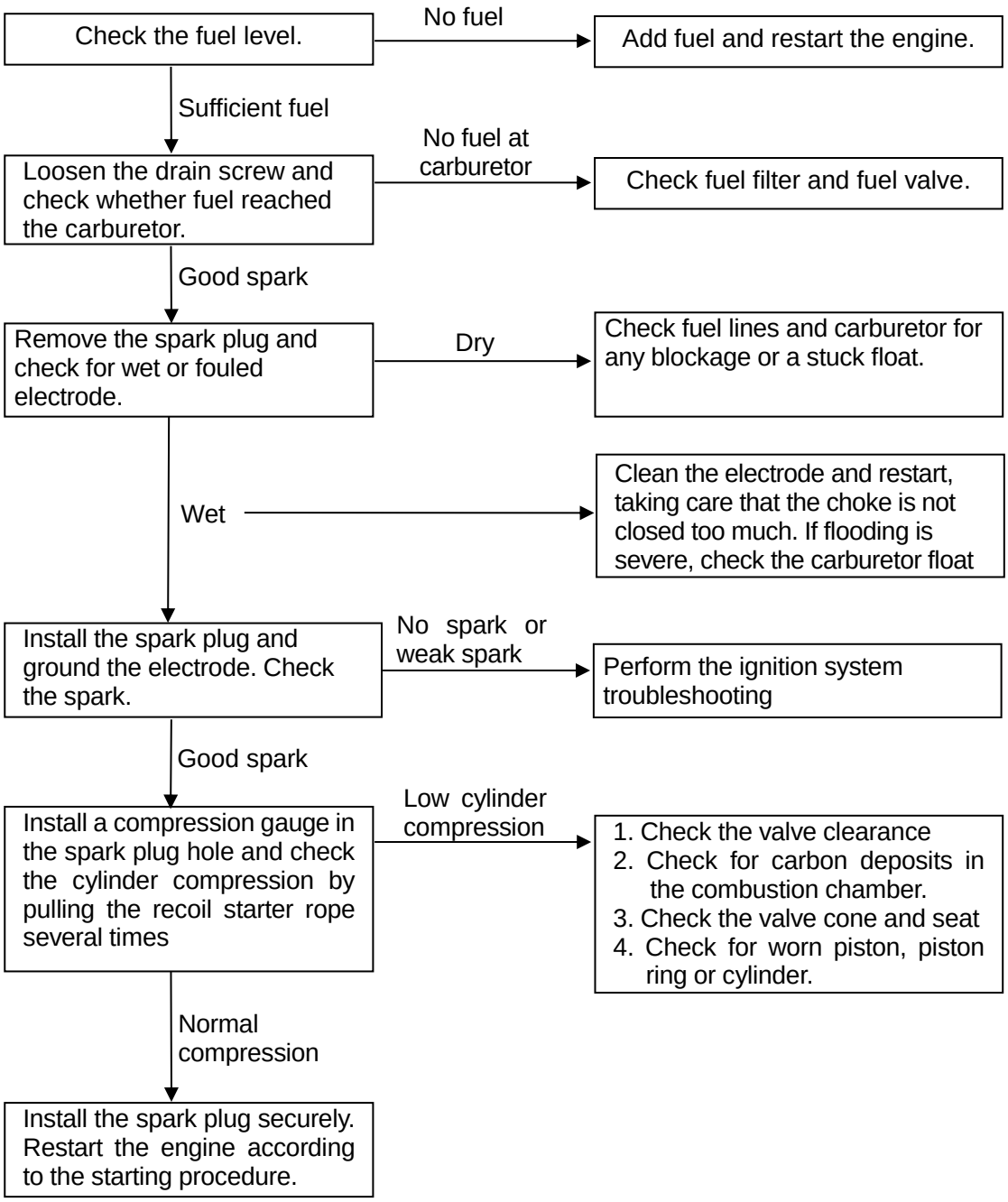
Note: Use standard torque values for fasteners that are not listed in this table.

3. Trouble shooting

3.1 General symptoms and possible causes

Engine does not start or hard starting	Automatic choke	Inspect
	Fuel filter clogged	Inspect / clean
	Battery fuse	Inspect / replace
	Fuel tank tube clogged	Inspect / clean
	Fuel valve clogged	Inspect / clean
	Fuel filter clogged	Inspect / replace
	Carburetor faulty	Inspect / clean
	Check valve / Choke pot faulty	Inspect / repair or replace
	Ignition coil faulty	Inspect / replace
	Spark plug faulty	Inspect / clean / replace
	Spark plug cap loose	Tighten
	Low oil sensor faulty	Inspect wiring / inspect sensor
	Ignition module	Inspect
	Ignition winding faulty	Inspect
	Throttle not opening properly	Set in fully close or half close position
Engine speed does not stabilize, too high or too low	Carburetor faulty	Inspect / disassemble and clean
	Economy switch	Inspect
	Throttle control motor (step motor) faulty	Inspect wiring / inspect motor
	Inverter unit faulty	Inspect / replace
	Valve clearance misadjusted	Readjust

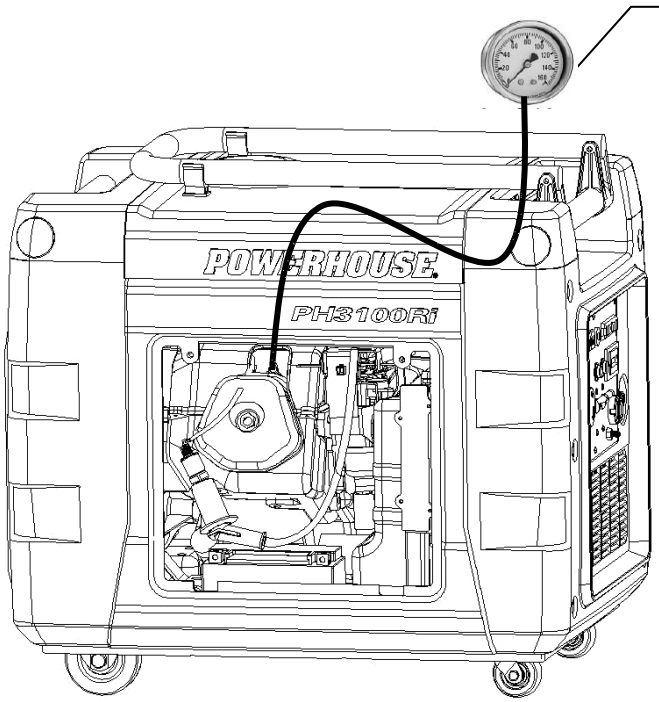
3.2 Hard starting

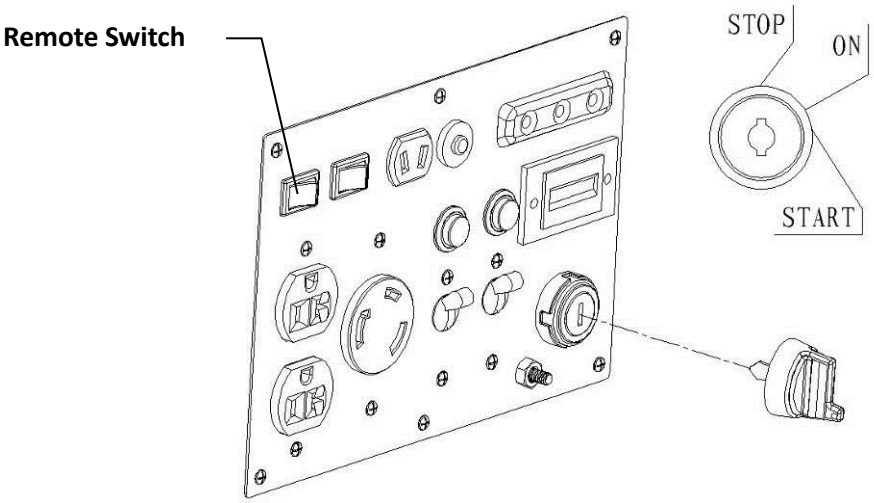

Check the fuel level.
No fuel
Add fuel and restart the engine.
Sufficient fuel
Loosen the drain screw and check whether fuel reached the carburetor.
No fuel at carburetor
Check fuel filter and fuel valve.
Good spark
Remove the spark plug and check for wet or fouled electrode.
Dry
Check fuel lines and carburetor for any blockage or a stuck float.
Wet
Clean the electrode and restart, taking care that the choke is not closed too much. If flooding is severe, check the carburetor float
Install the spark plug and ground the electrode. Check the spark.
No spark or weak spark
Perform the ignition system troubleshooting
Good spark
Install a compression gauge in the spark plug hole and check the cylinder compression by pulling the recoil starter rope several times
Low cylinder compression
1. Check the valve clearance
2. Check for carbon deposits in the combustion chamber.
3. Check the valve cone and seat
4. Check for worn piston, piston ring or cylinder.
Normal compression
Install the spark plug securely. Restart the engine according to the starting procedure.

3.3 Cylinder compression check

1. Remove the spark plug cap and spark plug.
2. Install a compression gauge in the spark plug hole.
3. Push the remote switch to the OFF position.
4. Turn the ignition switch to the start position and measure the cylinder compression.

Cylinder compression	0.45Mpa (65 psi) /800rpm





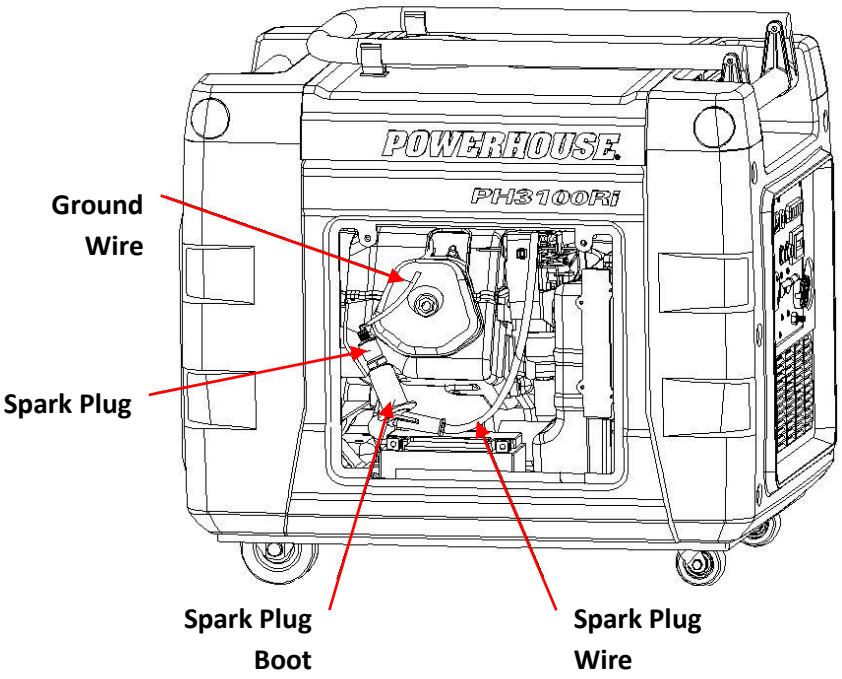
3.4 Ignition system

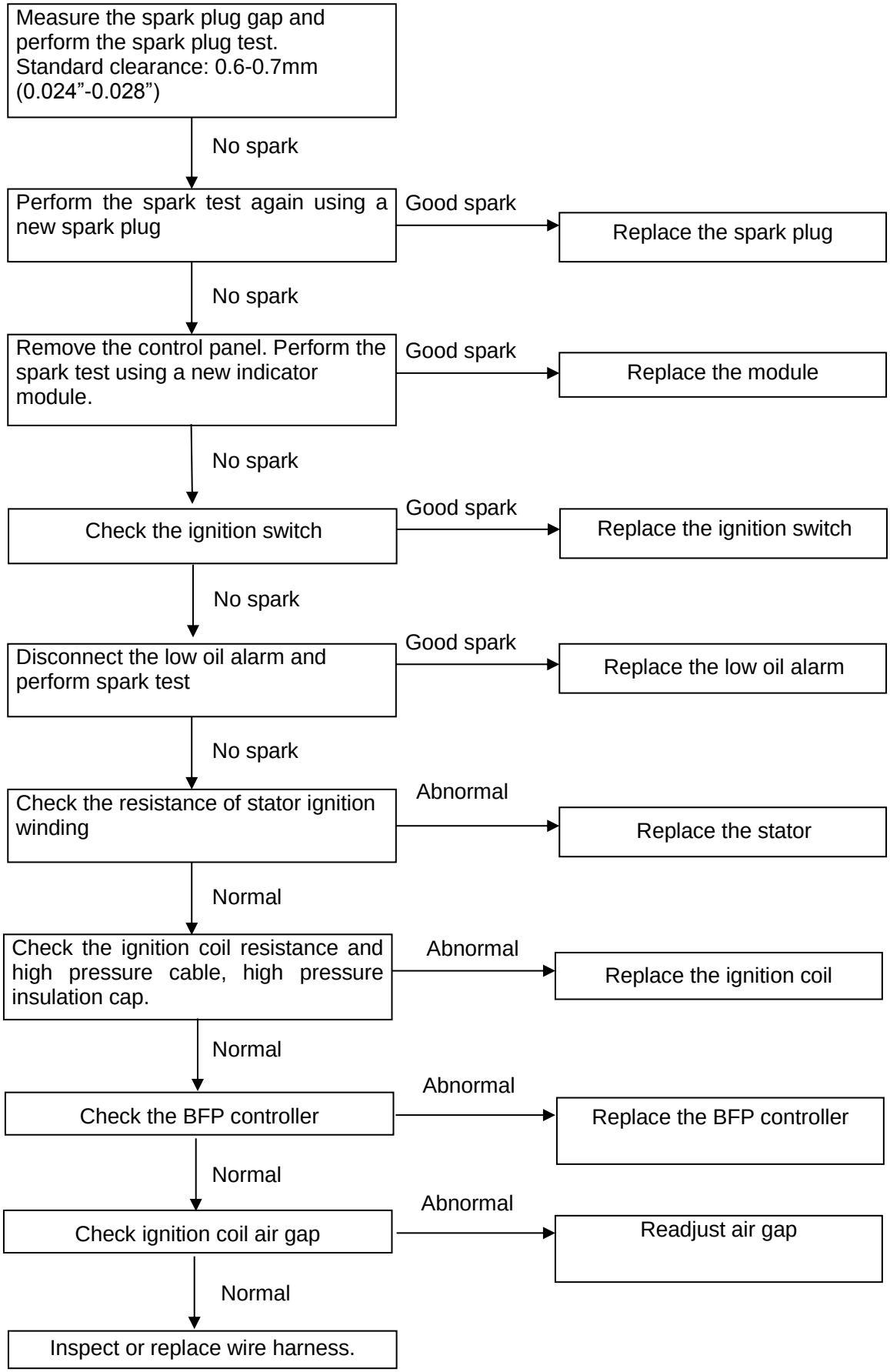
- Fill the oil reservoir to the correct level.
- Use **F7RTC** or equivalent spark plug.
- Spark plug inspection

Warning

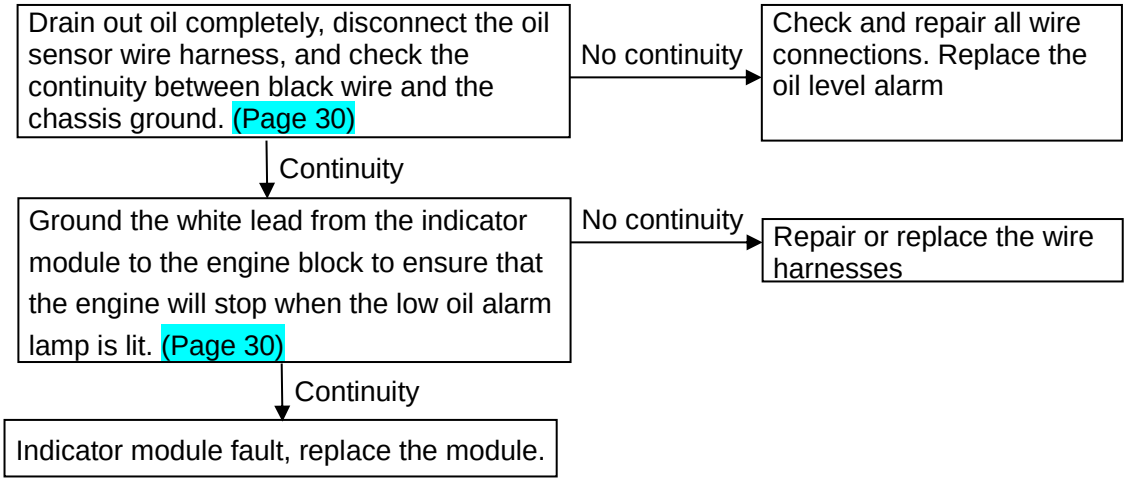
- Don't pull the recoil starter or turn the ignition switch to "START" while touching the high tension wire.
- Turn off the fuel valve.
- Pull the recoil starter several times to release the unburned gas in the cylinder with the engine switch OFF.

1. Remove spark plug.
2. Install the spark plug into the plug cap.
3. Turn the ignition switch to the "ON" position. Attach the negative (—) electrode (i.e. threaded part) of the spark plug to your ground wire and pull the recoil starter rope to check the spark plug.

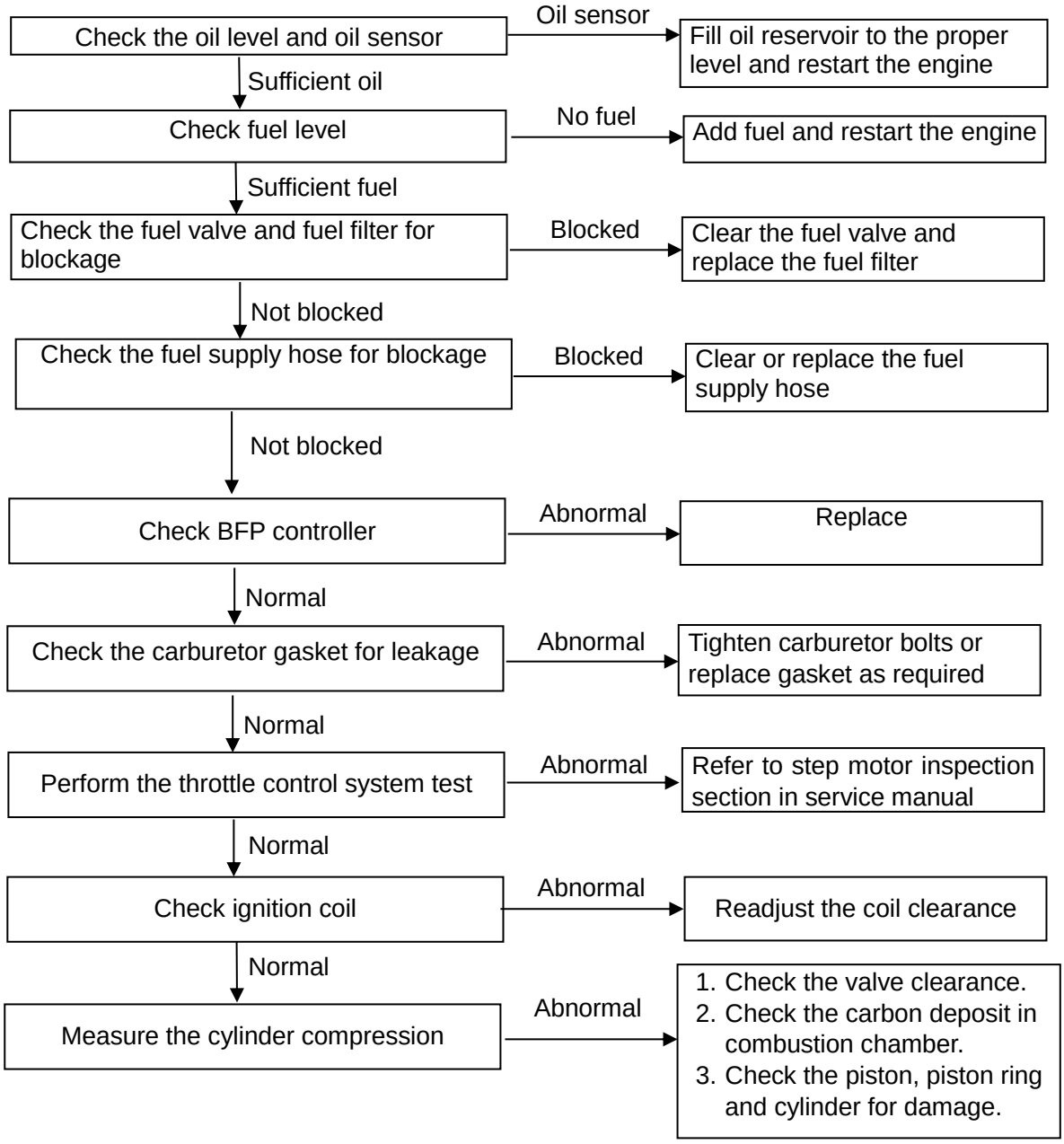



Measure the spark plug gap and perform the spark plug test. Standard clearance: 0.6-0.7mm (0.024”-0.028”)
No spark
Perform the spark test again using a new spark plug
Good spark
Replace the spark plug
No spark
Remove the control panel. Perform the spark test using a new indicator module.
Good spark
Replace the module
No spark
Check the ignition switch
Good spark
Replace the ignition switch
No spark
Disconnect the low oil alarm and perform spark test
Good spark
Replace the low oil alarm
No spark
Check the resistance of stator ignition winding
Abnormal
Replace the stator
Normal
Check the ignition coil resistance and high pressure cable, high pressure insulation cap.
Abnormal
Replace the ignition coil
Normal
Check the BFP controller
Abnormal
Replace the BFP controller
Normal
Check ignition coil air gap
Abnormal
Readjust air gap
Normal
Inspect or replace wire harness.

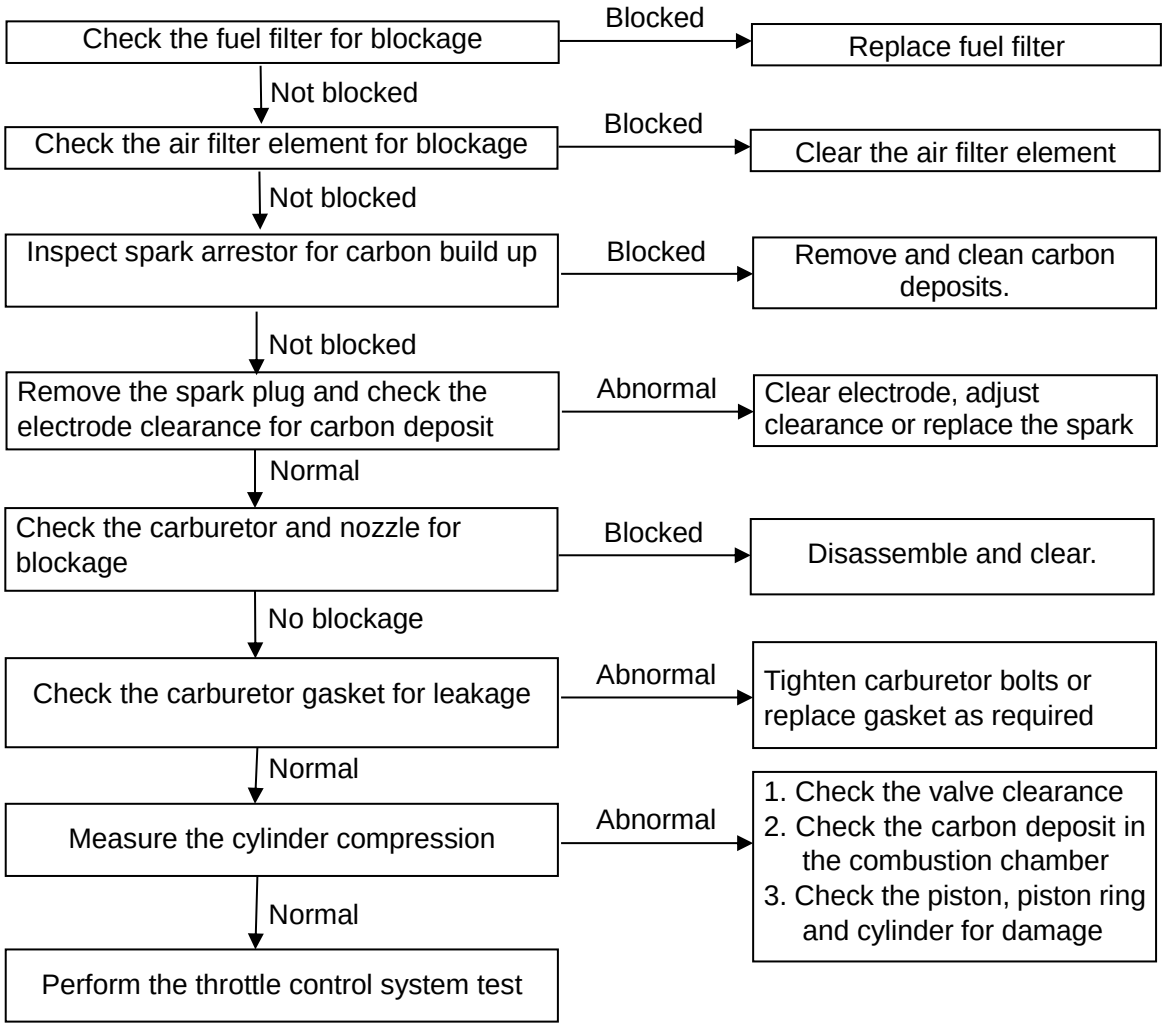
3.5 Engine oil level is low, but engine does not stop.


Drain out oil completely, disconnect the oil sensor wire harness, and check the continuity between black wire and the chassis ground. (Page 30)
No continuity
Check and repair all wire connections. Replace the oil level alarm
Continuity
Ground the white lead from the indicator module to the engine block to ensure that the engine will stop when the low oil alarm lamp is lit. (Page 30)
No continuity
Repair or replace the wire harnesses
Continuity
Indicator module fault, replace the module.

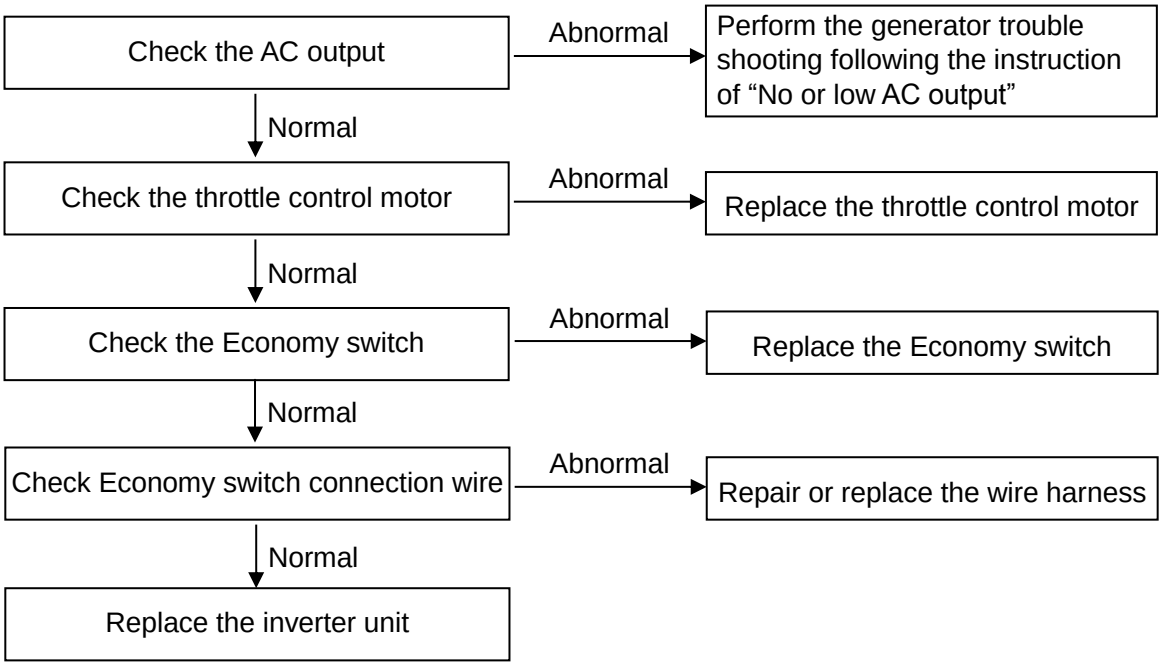
3.6 Engine stops running (Throttle is in the correct position)


Check the oil level and oil sensor
Oil sensor
Fill oil reservoir to the proper level and restart the engine
Sufficient oil
Check fuel level
No fuel
Add fuel and restart the engine
Sufficient fuel
Check the fuel valve and fuel filter for blockage
Blocked
Clear the fuel valve and replace the fuel filter
Not blocked
Check the fuel supply hose for blockage
Blocked
Clear or replace the fuel supply hose
Not blocked
Check BFP controller
Abnormal
Replace
Normal
Check the carburetor gasket for leakage
Abnormal
Tighten carburetor bolts or replace gasket as required
Normal
Perform the throttle control system test
Abnormal
Refer to step motor inspection section in service manual
Normal
Check ignition coil
Abnormal
Readjust the coil clearance
Normal
Measure the cylinder compression
Abnormal
1. Check the valve clearance.
2. Check the carbon deposit in combustion chamber.
3. Check the piston, piston ring and cylinder for damage.

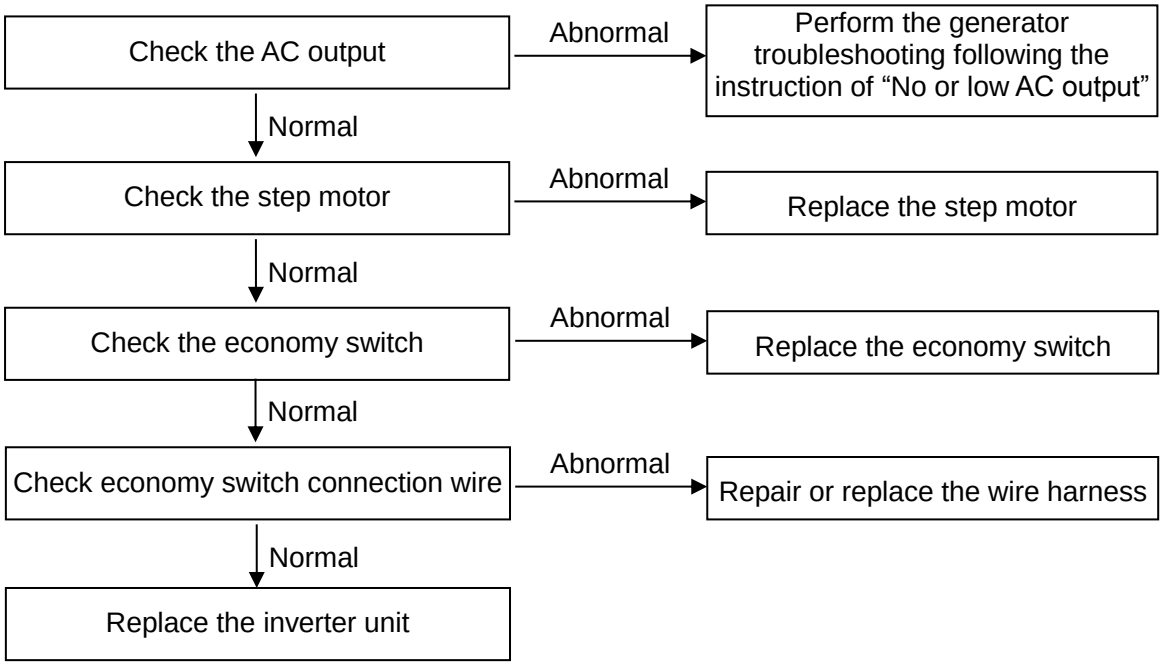
3.7 Engine speed can’t increase or is unstable (choke is in the correct position)


Check the fuel filter for blockage
Blocked
Replace fuel filter
Not blocked
Check the air filter element for blockage
Blocked
Clear the air filter element
Not blocked
Inspect spark arrestor for carbon build up
Blocked
Remove and clean carbon deposits.
Not blocked
Remove the spark plug and check the electrode clearance for carbon deposit
Abnormal
Clear electrode, adjust clearance or replace the spark
Normal
Check the carburetor and nozzle for blockage
Blocked
Disassemble and clear.
No blockage
Check the carburetor gasket for leakage
Abnormal
Tighten carburetor bolts or replace gasket as required
Normal
Measure the cylinder compression
Abnormal
1. Check the valve clearance
2. Check the carbon deposit in the combustion chamber
3. Check the piston, piston ring and cylinder for damage
Normal
Perform the throttle control system test

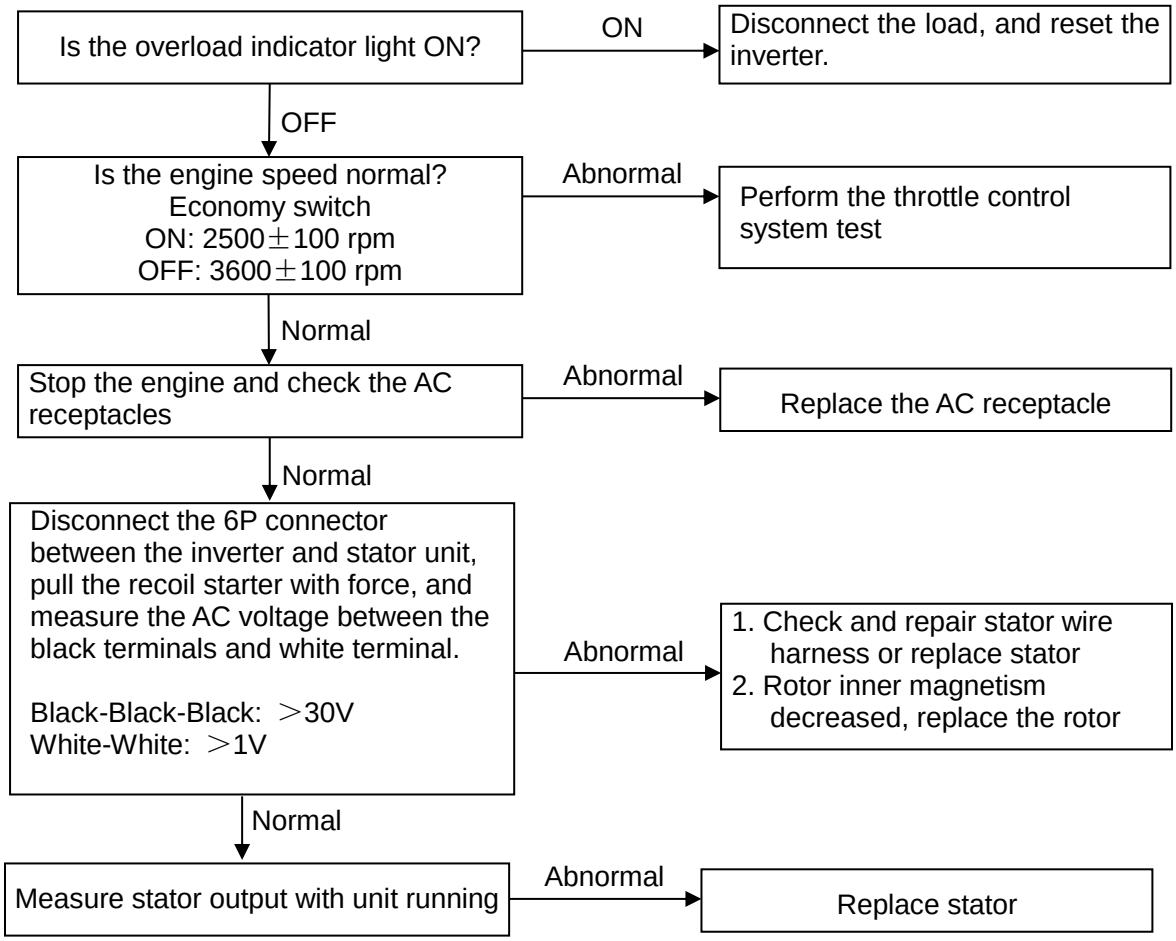
3.8 Engine speed too high or too low



3.9 Engine speed doesn't increase with economy system "ON" and a load connected.

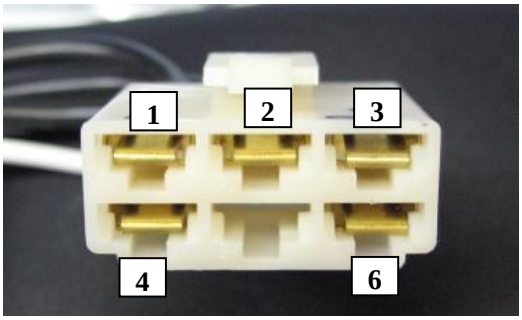


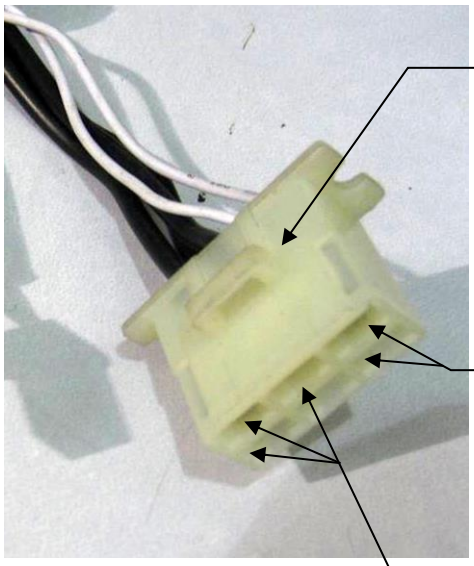
3.10 No or low AC output


Is the overload indicator light ON?
ON
Disconnect the load, and reset the inverter.
OFF
Is the engine speed normal?
Economy switch
ON: 2500±100 rpm
OFF: 3600±100 rpm
Abnormal
Perform the throttle control system test
Normal
Stop the engine and check the AC receptacles
Abnormal
Replace the AC receptacle
Normal
Disconnect the 6P connector between the inverter and stator unit, pull the recoil starter with force, and measure the AC voltage between the black terminals and white terminal.
Black-Black-Black: ＞30V
White-White: ＞1V
Abnormal
1. Check and repair stator wire harness or replace stator
2. Rotor inner magnetism decreased, replace the rotor
Normal
Measure stator output with unit running
Abnormal
Replace stator

3.11 Measuring stator output voltage while running

6-Pin Stator Receptacle





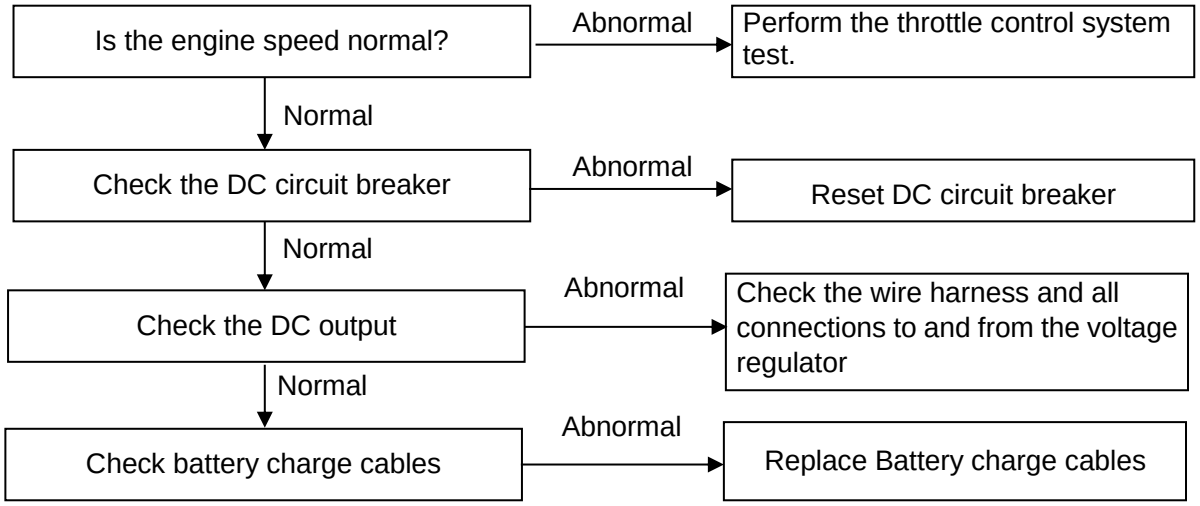
6-Pin Stator Connector

White Sub Windings 3 & 6

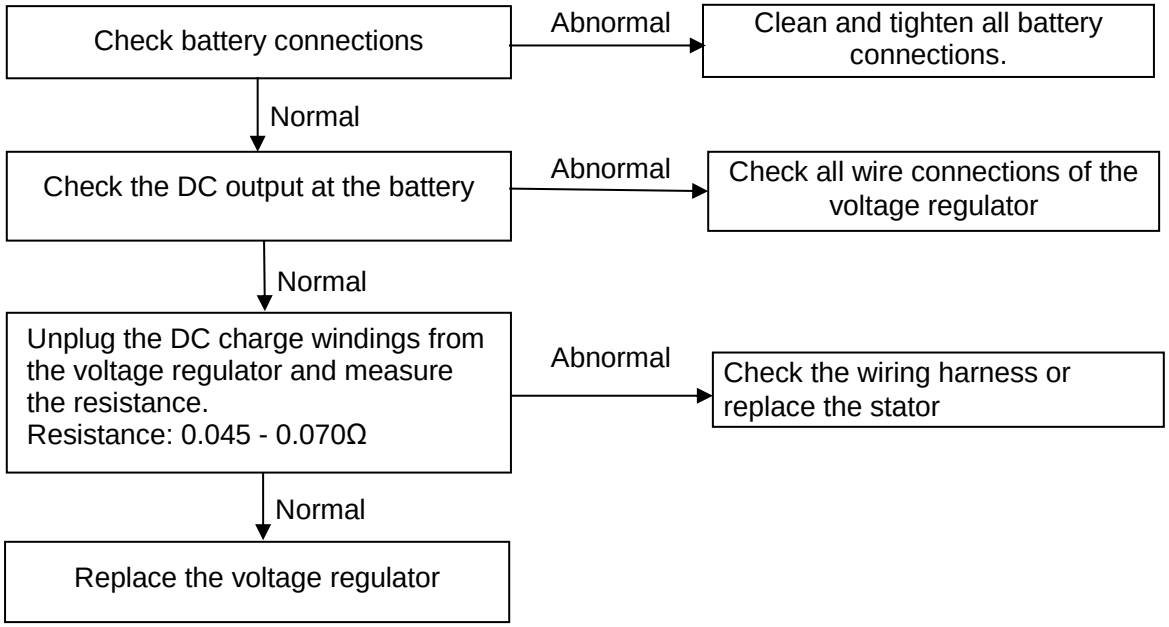
Black Phase Wires, 1, 2 & 4

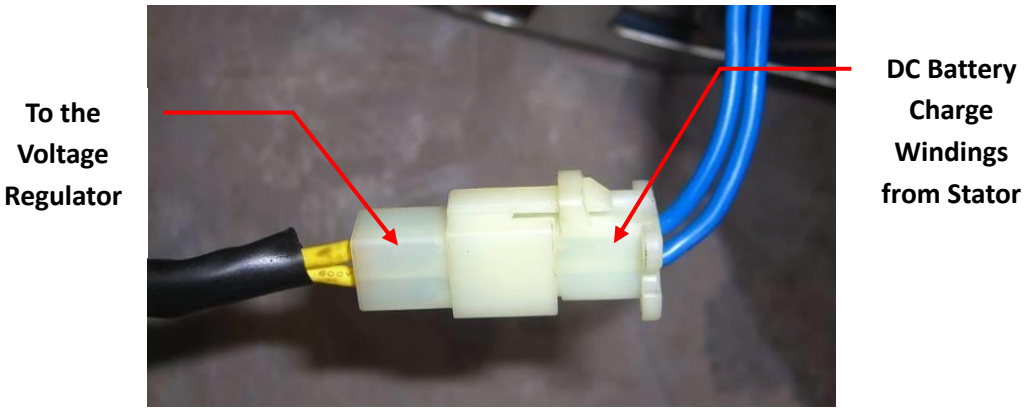
1. Unplug the connector from the inverter and start the engine, check voltage between pins 1 & 4, between pins 2 & 4, and between pins 1 & 2. Note, the engine will be running at a high RPM.
2. They should be approximately 300vac at each test with the engine running at high speed. If one or more of the three tests fail, the problem is either a damaged wire harness or a defective alternator. If the wire harness is the problem, look for and repair the damage.
3. If the alternator is the problem, the stator will need to be replaced. If all three tests are OK, the problem is probably the inverter.

3.12 No DC output at battery charge receptacle

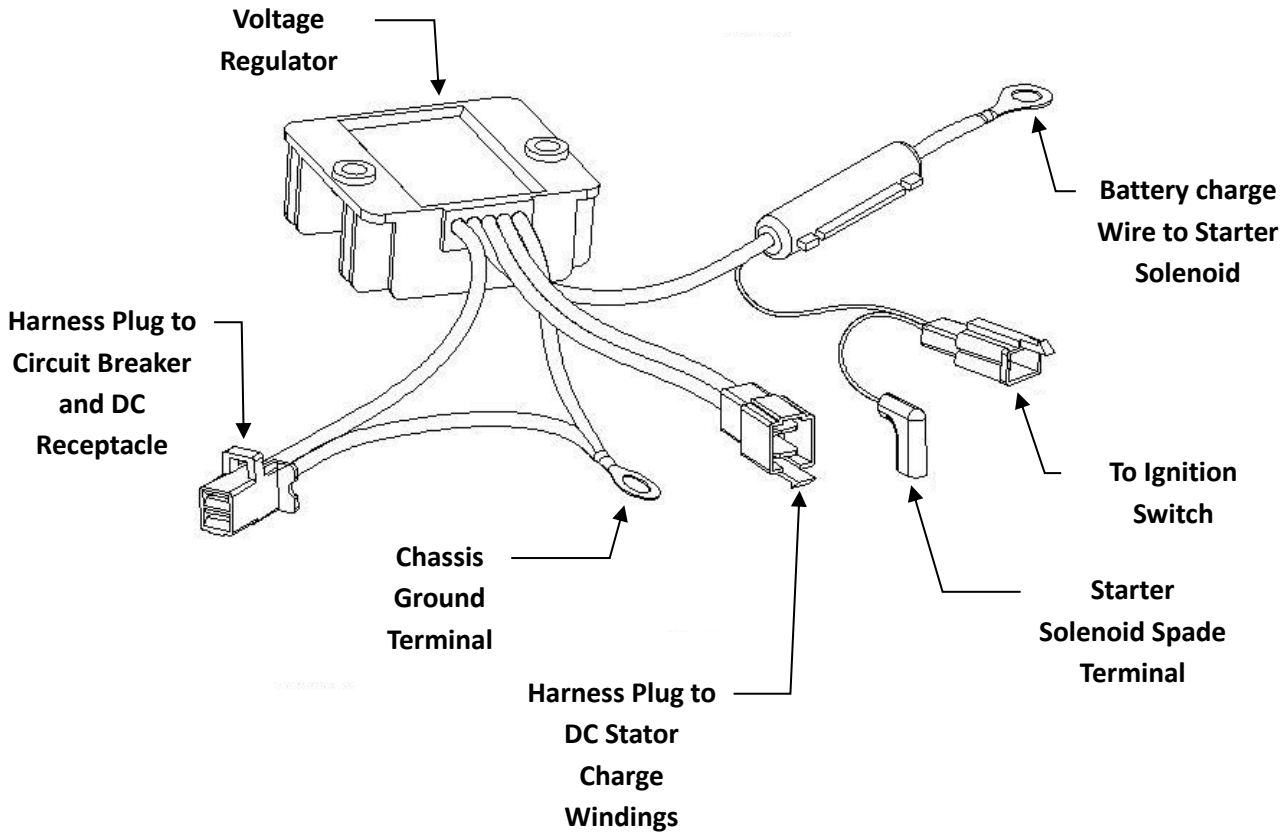


3.13 Battery will not charge

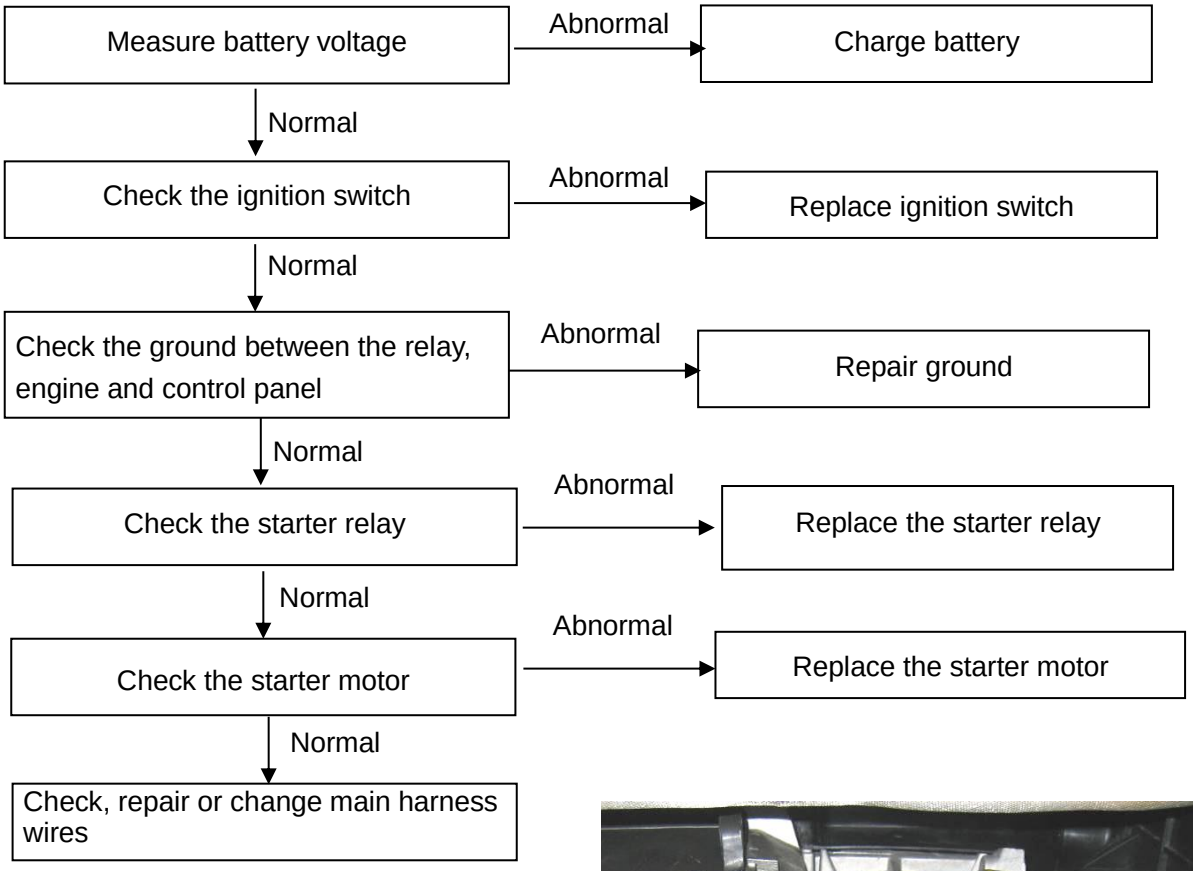

Check battery connections
Abnormal
Clean and tighten all battery connections.
Normal
Check the DC output at the battery
Abnormal
Check all wire connections of the voltage regulator
Normal
Unplug the DC charge windings from the voltage regulator and measure the resistance.
Resistance: 0.045 - 0.070Ω
Abnormal
Check the wiring harness or replace the stator
Normal
Replace the voltage regulator

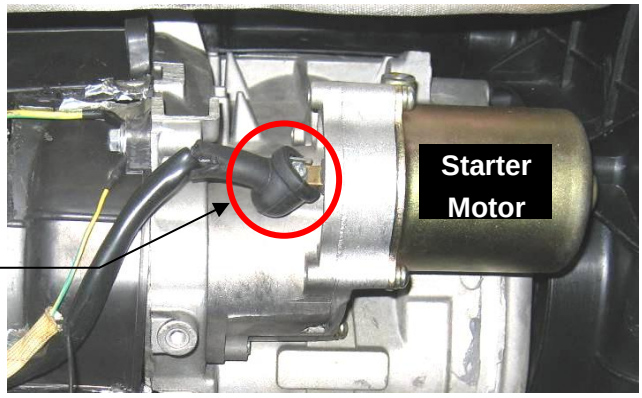


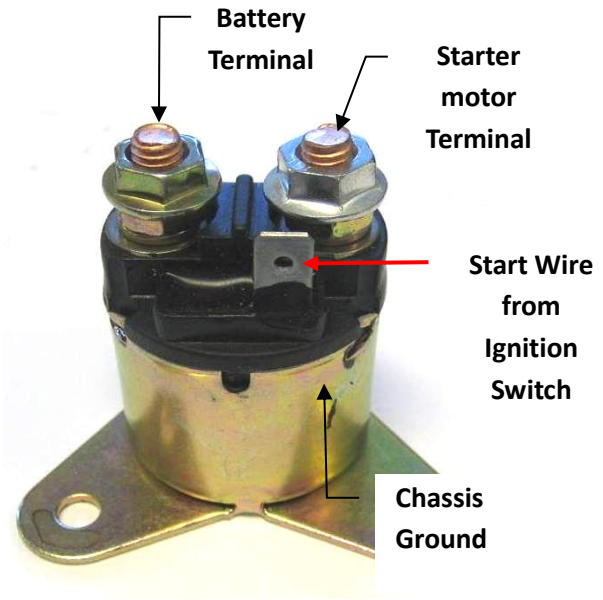
1. Battery charge voltage from the voltage regulator at the starter battery should be 12.0 to 14.5 volt DC. Battery charge.
2. The voltage to the control panel should measure 13 to 15 volts DC.

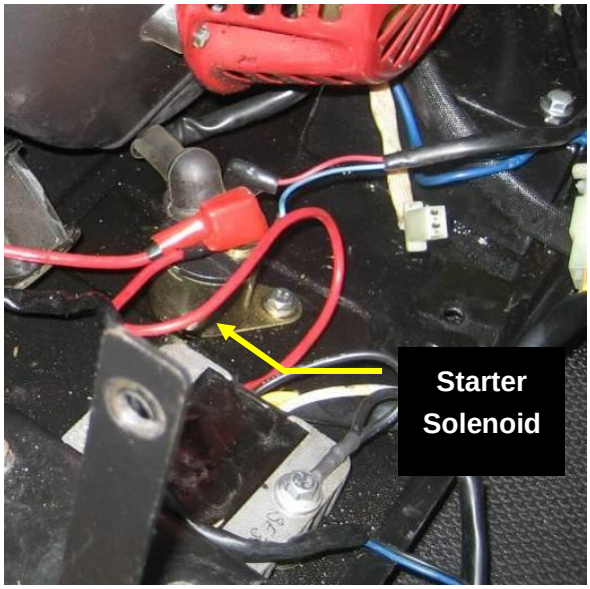

Voltage Regulator
Battery charge Wire to Starter Solenoid
Harness Plug to Circuit Breaker and DC Receptacle
To Ignition Switch
Chassis Ground Terminal
Starter Solenoid Spade Terminal
Harness Plug to DC Stator Charge Windings

3.14 No electric start







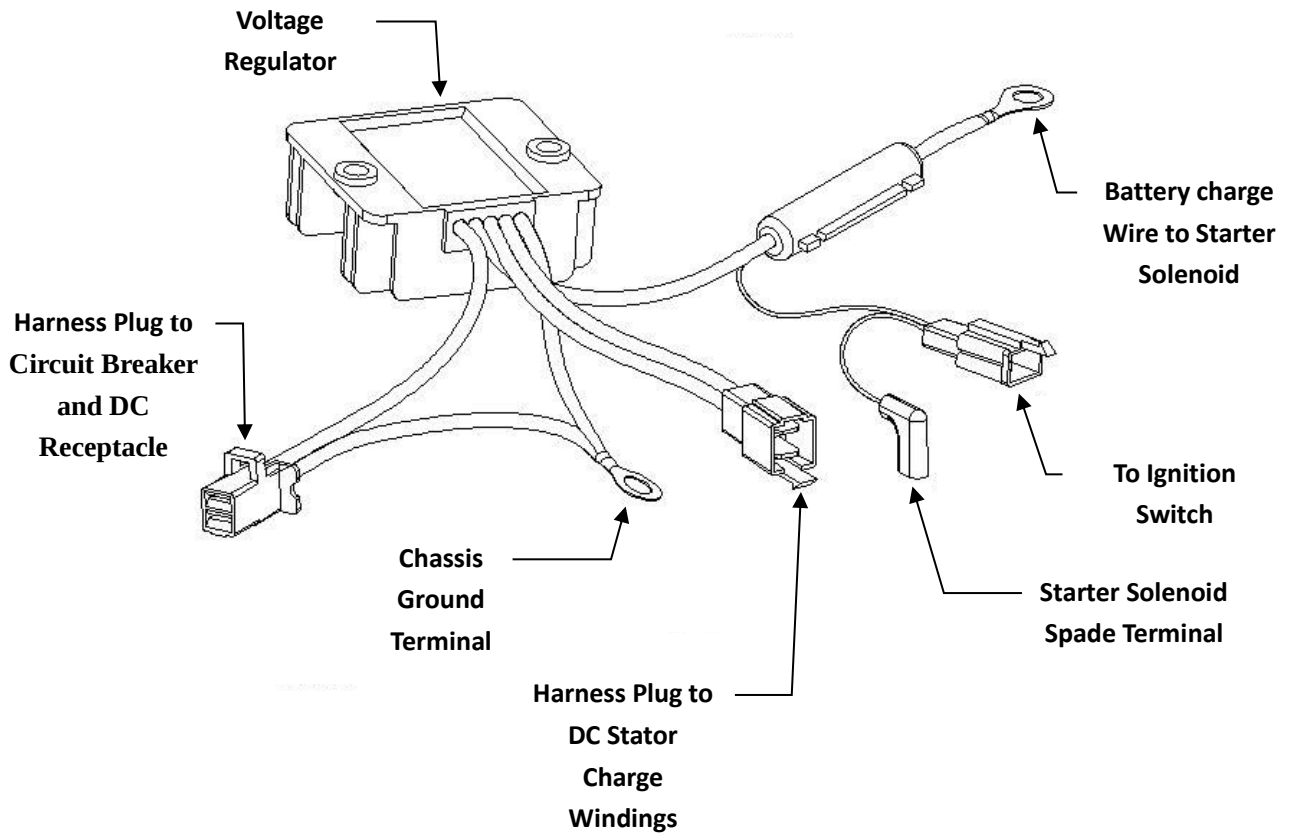


3.15 Engine will not shut off with ignition key, remote or stop button

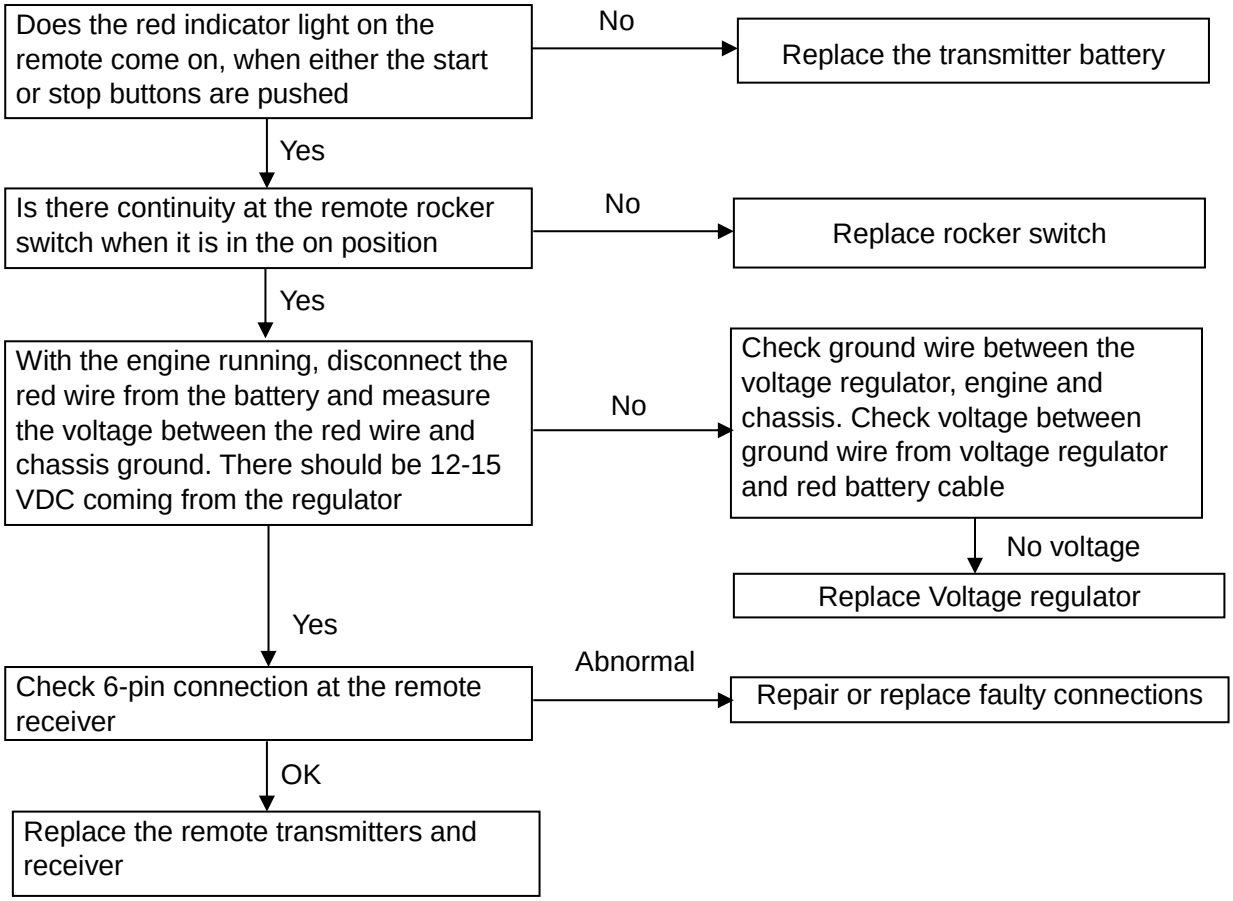
For safety, we recommend turning off the fuel valve instead of pulling off the spark plug wire.

What to check for:

1. Turn on the fuel valve and restart the engine.
2. Using a volt ohm meter check the battery charge receptacle. There should be between 12 and 14 volts DC. If no voltage is present check all connections to and from the voltage regulator.
3. Check to make sure that there is a good ground between the voltage regulator ground wire, engine and control panel. A bad ground will prevent the unit from shutting down properly.
4. Locate and unplug the two blue wires between the stator and voltage regulator. With the engine running the voltage from the stator must be 12-20VAC. If no voltage is present the stator is defective. If voltage is present replace the voltage regulator.
5. If voltage is present at the control panel, make sure that the remote switch on the control panel is in the off position.
6. Check the 6-pin connection between the remote receiver and control panel looking for any loose or broken wires. If no problems are found replace the remote receiver.


Voltage Regulator
Battery charge Wire to Starter Solenoid
Harness Plug to Circuit Breaker and DC Receptacle
To Ignition Switch
Chassis Ground Terminal
Starter Solenoid Spade Terminal
Harness Plug to DC Stator Charge Windings

3.16 Engine will not start or stop with remote.

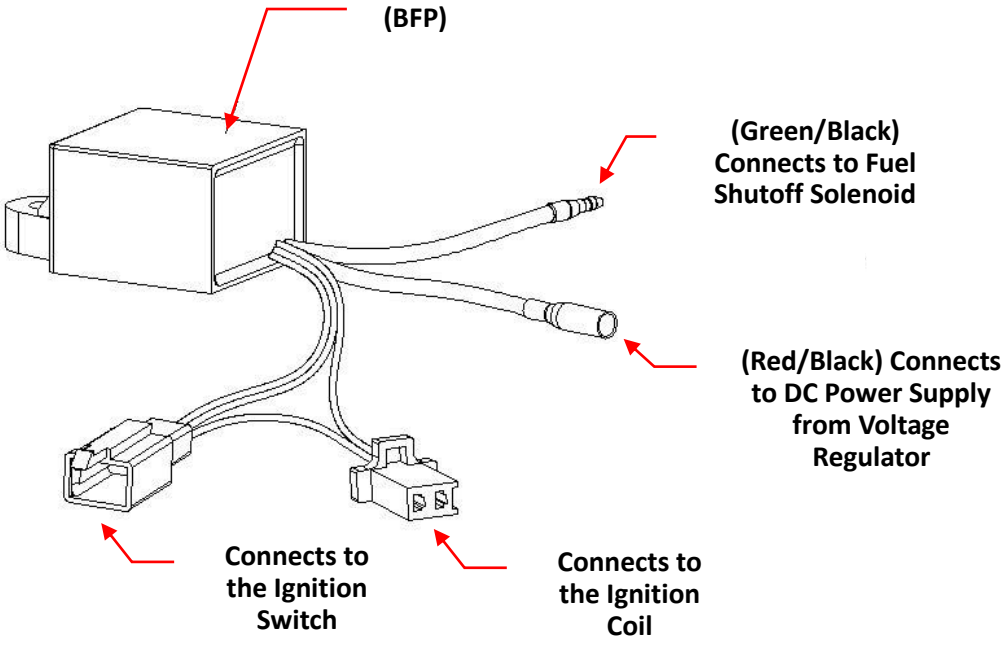

Does the red indicator light on the remote come on, when either the start or stop buttons are pushed
No
Replace the transmitter battery
Yes
Is there continuity at the remote rocker switch when it is in the on position
No
Replace rocker switch
Yes
With the engine running, disconnect the red wire from the battery and measure the voltage between the red wire and chassis ground. There should be 12-15 VDC coming from the regulator
No
Check ground wire between the voltage regulator, engine and chassis. Check voltage between ground wire from voltage regulator and red battery cable
No voltage
Replace Voltage regulator
Yes
Check 6-pin connection at the remote receiver
Abnormal
Repair or replace faulty connections
OK
Replace the remote transmitters and receiver

3.17 Engine will struggle when shut off with key or remote, but keeps running rough.

For safety, we recommend turning off the fuel valve instead of pulling off the spark plug wire.

What to check for:

1. Remove the end panel and locate the BFP (Back Fire Controller).
2. Check all connections and repair or correct as needed.
3. Disconnect the green/black wire from the fuel shut-off solenoid.
4. Turn on the fuel valve and restart the engine.
5. Using a volt-ohm meter, connect the positive lead to the green/black connector from the BFP (Back Fire Controller), and the ground lead to the engine or chassis.
6. When the ignition switch is turned off there must be 12 VDC on the green/black wire for several seconds. If there is no 12 VDC, replace the BFP controller.


(BFP)
(Green/Black) Connects to Fuel Shutoff Solenoid
(Red/Black) Connects to DC Power Supply from Voltage Regulator
Connects to the Ignition Switch
Connects to the Ignition Coil

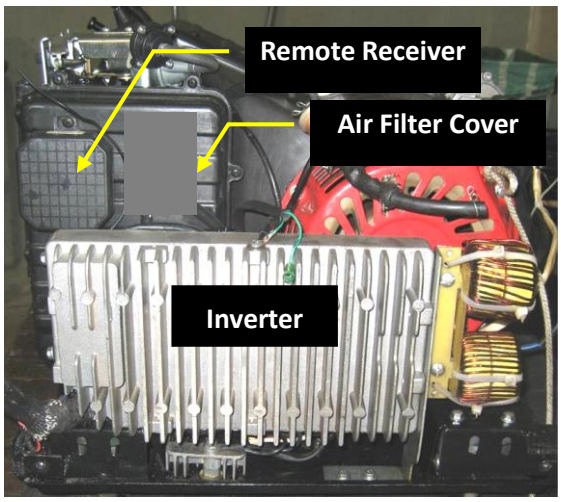
3.18 Engine will start and then shut down.

This condition can affect the ignition switch, remote and manual start system

What to check for:

1. Check engine oil level and fill to the proper level as required..
2. If the low oil light comes on and the oil level is correct, refer to low oil sensor trouble shooting section.
3. Remove the front control panel and unplug the remote receiver.
4. If the unit will now start and continue to run replace the receiver and transmitters.

Note, with the receiver unplugged, the generator will not shut off using the ignition switch. To shut down the unit, reconnect the receiver or turn off the fuel lever.



4. Maintenance

4.1 Maintenance schedule

Item	Maintenance Procedure	Regular Service period (1). Perform at every indicated month or operating hour interval, whichever occurs first.				
		Each Use	First Month Or 20 HRS	Every 3 Months or 50 HRS	Every 6 Months Or 100 HRS	Every Year Or 300 HRS
Engine Oil	Check	O				
	Change		O		O	
Air cleaner	Check	O				
	Clean			O(2)		
Spark Plug	Clean - adjust				O	
Spark Arrester	Clean				O	
Fuel Filter	Check	O				
	Replace					O(2)
Valve clearance	Check - adjust					O(3)
Fuel tank & strainer	Clean					O(2)
Fuel line	Check	Every 2-years (Replace as necessary) (3)				

Notes:

(1) For commercial use, operation hours are determined by proper maintenance.

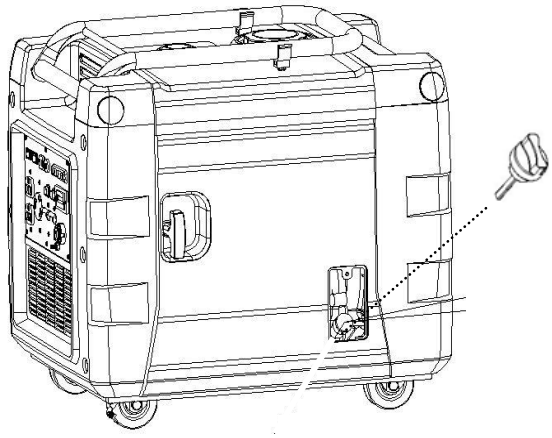
(2) Service more frequently when operating in dusty areas, every 10 hrs or every day.

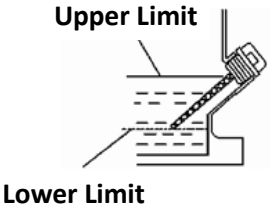
(3) Service should be performed by a POWERHOUSE® authorized agency, unless correct tools and a professional specialist are available. Service should always be performed according to the service manual.

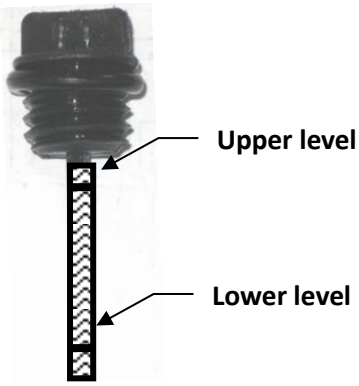
4.2 Checking the oil level

Stop the engine and check the oil level, be sure to put the engine on a flat surface when checking.

1. Loosen the screw on the engine oil access cover and remove the cover.
2. Remove the oil filler cap and check for the oil level.
3. If the oil level is low, add oil until it reaches the edge of the oil filler port.







4.3 Changing oil

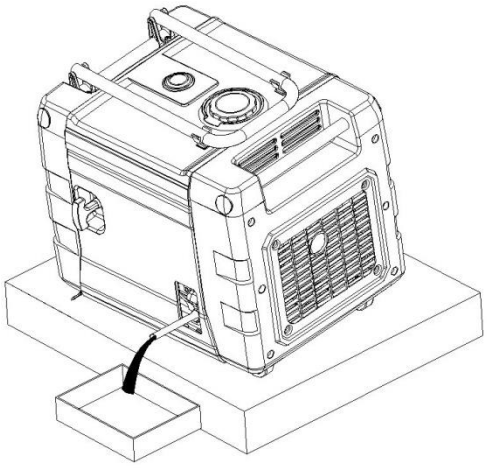
Drain the oil while the engine is still warm to assure rapid and complete draining.

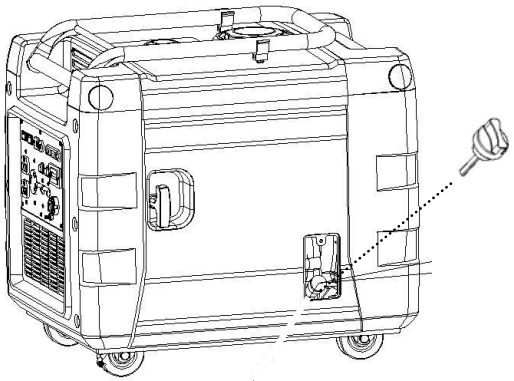
⚠ CAUTION

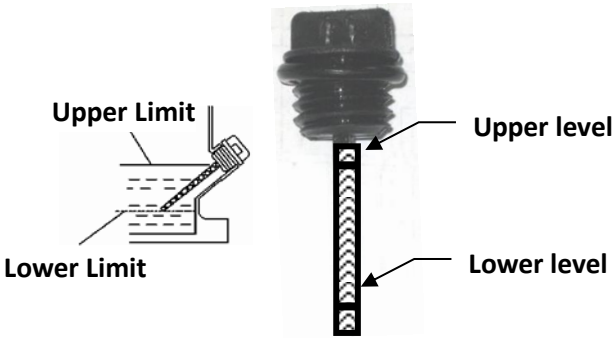
■ Make sure to turn the engine switch and fuel lever OFF before draining.

1. Loosen the screw on the engine oil access cover and remove the cover.
2. Remove the oil filler cap.
3. Install the oil drain pipe.
4. Drain dirty oil into a container. Allow enough time for the oil to drain completely.
5. Refill with the recommended oil, and check the oil level.
6. Reinstall the access cover and tighten the screw securely.

Engine oil capacity: 35 oz. (1.0L)







⚠ NOTE

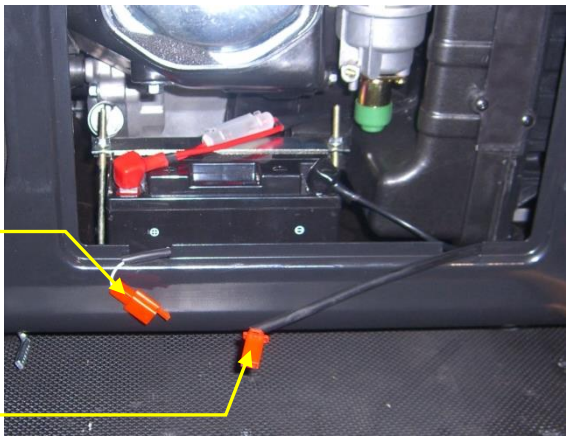
■ Please dispose of used motor oil in a manner that is compatible with the environment and local disposal regulations. Do not throw it in the trash or pour it on the ground.

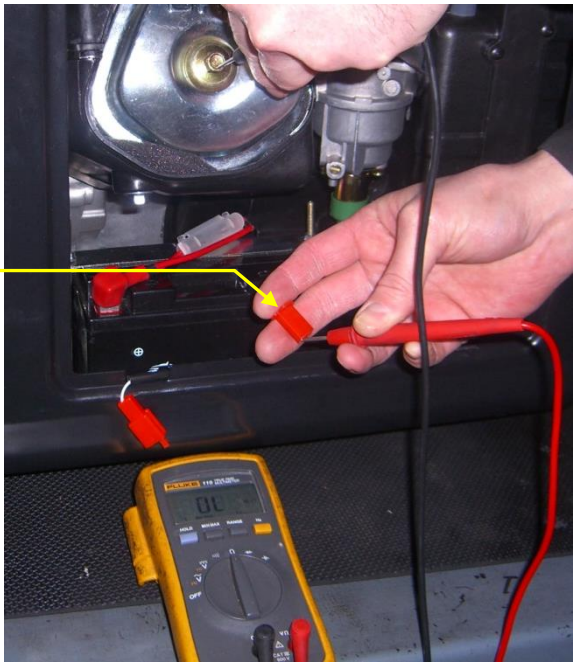
4.4 Checking the low oil sensor

1. Remove the maintenance cover and locate the oil sensor lead which is between the battery and the side panel.
2. Disconnect the low oil sensor while the engine is running.
3. Ground the white lead from the indicator module to the engine block, to verify that the engine will stop when the low oil alarm lamp is lit.
4. After confirming that the engine oil is at the proper level, test for continuity between the terminal of the black oil sensor lead and the case of the engine. No continuity indicates a normal condition.
5. Continuity between the black oil sensor lead and engine when the oil is drained from the engine indicates a normal condition.

⚠ WARNING

- No continuity after the oil has been drained would indicate a faulty oil sensor or a damaged wire that must be repaired or replaced. Failure to do so can lead to permanent damage if the engine runs low on oil.

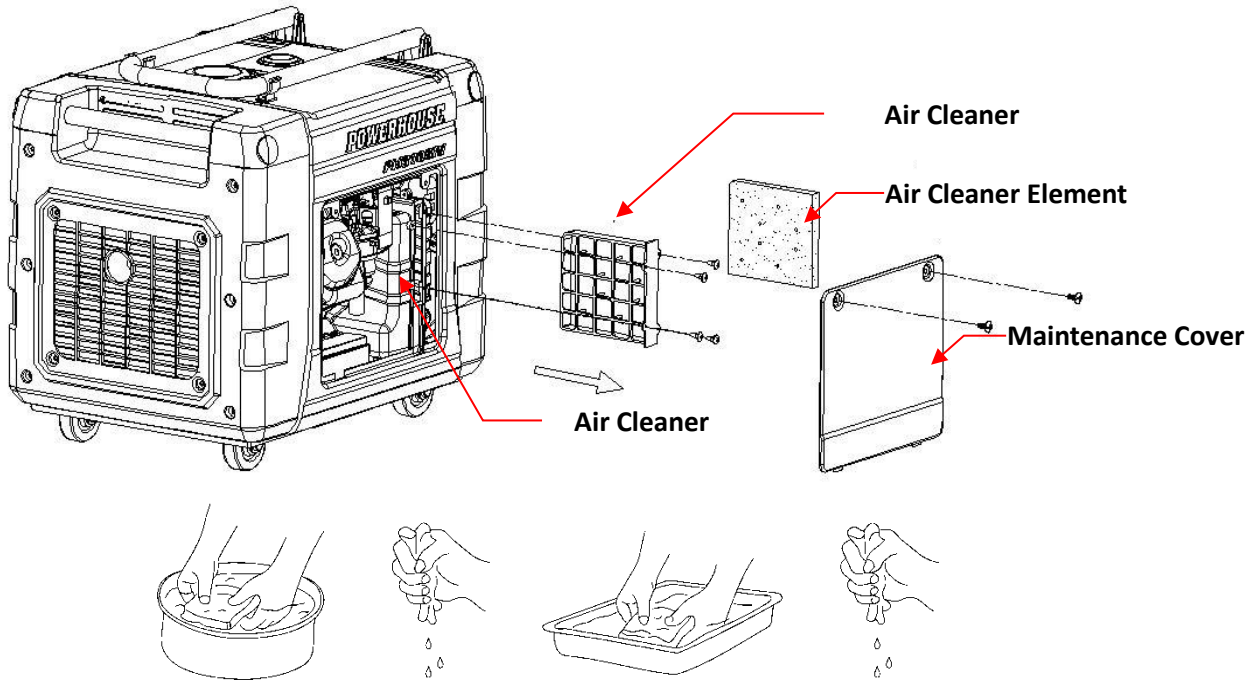




4.5 Air Cleaner

Inspection / Cleaning:

1. Loosen the panel screws and remove the side maintenance cover.
2. Remove the four cartridge retaining screws.
3. Remove the filter cartridge and the fine and coarse filter elements.
4. Wash the elements in a non-flammable or high flash point solvent and dry them thoroughly.
5. Soak the fine element in clean engine oil and squeeze out the excess oil.
6. Reinstall the coarse and fine air cleaner elements and the air filter cartridge. Tighten the four cartridge screws securely.
7. Reinstall the maintenance cover and tighten the screws securely.



Caution

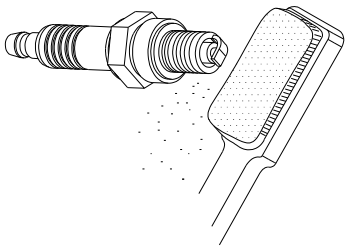
■ A dirty air cleaner will restrict air flow to the carburetor, reducing engine performance. If the engine is operated in dusty areas, clean the air cleaner more often than specified in the Maintenance Schedule.

■ Never run the engine if there is no element or if the filter is damaged, as it will cause serious damage to the engine.

4.6 Spark plug

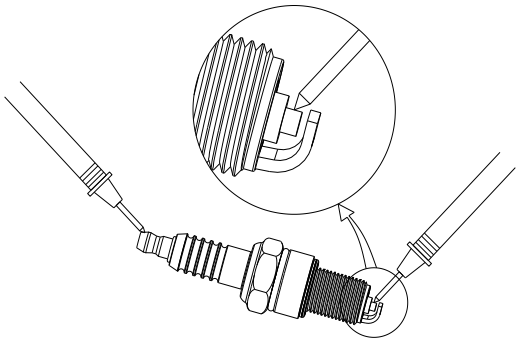
Inspection / Cleaning:

1. Remove the spark plug cap and remove the spark plug.
2. Remove carbon or other deposits with a plug cleaner or stiff wire brush. Check the sealing washer for damage.



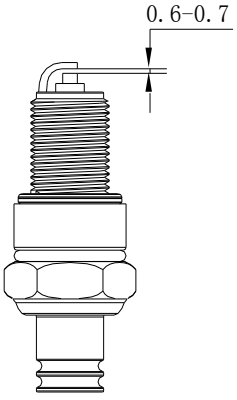
3. Measure the plug resistance; replace the spark plug if the resistance is outside of these values.

Spark plug resistance	3-9KΩ



4. Measure the plug gap with a wire-type feeler gauge. Adjust by bending the side electrode if the measurement is not within the specified clearance.

Spark plug clearance	0.6-0.7mm (0.024”-0.028”)
Standard spark plug	F7RTC



5. Install the plug finger tight to seat the washer, and then tighten with a plug wrench.
   Torque valve is 8.9-11 lbf-ft (12-15 Nm)

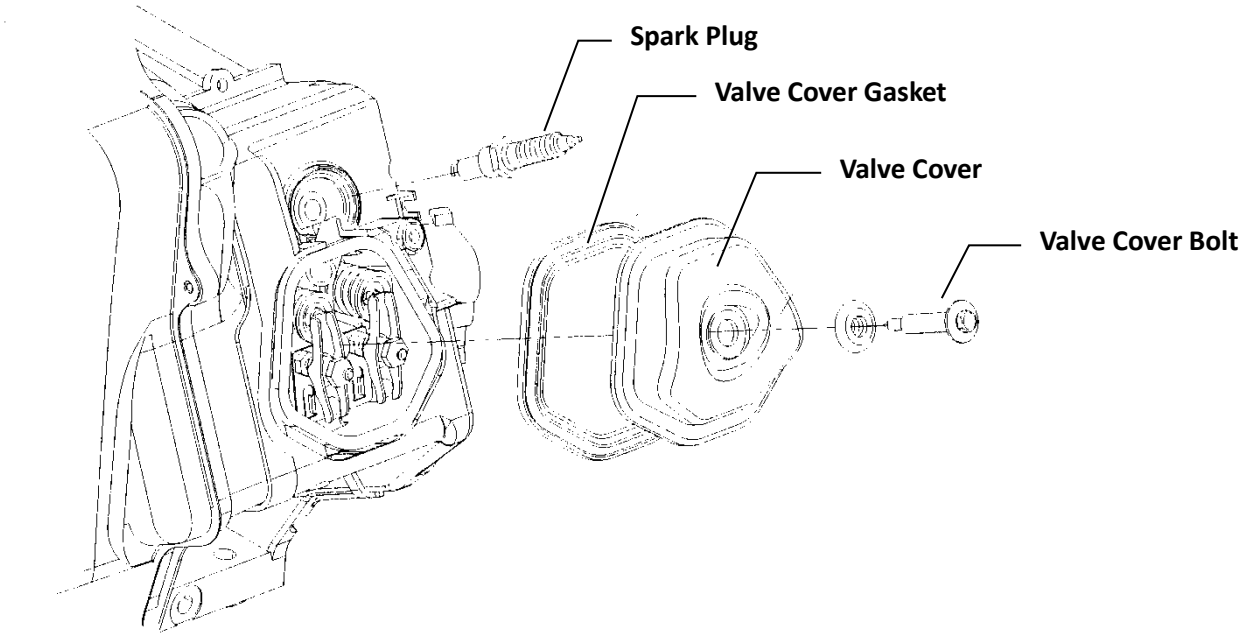
4.7 Valve clearance

Caution

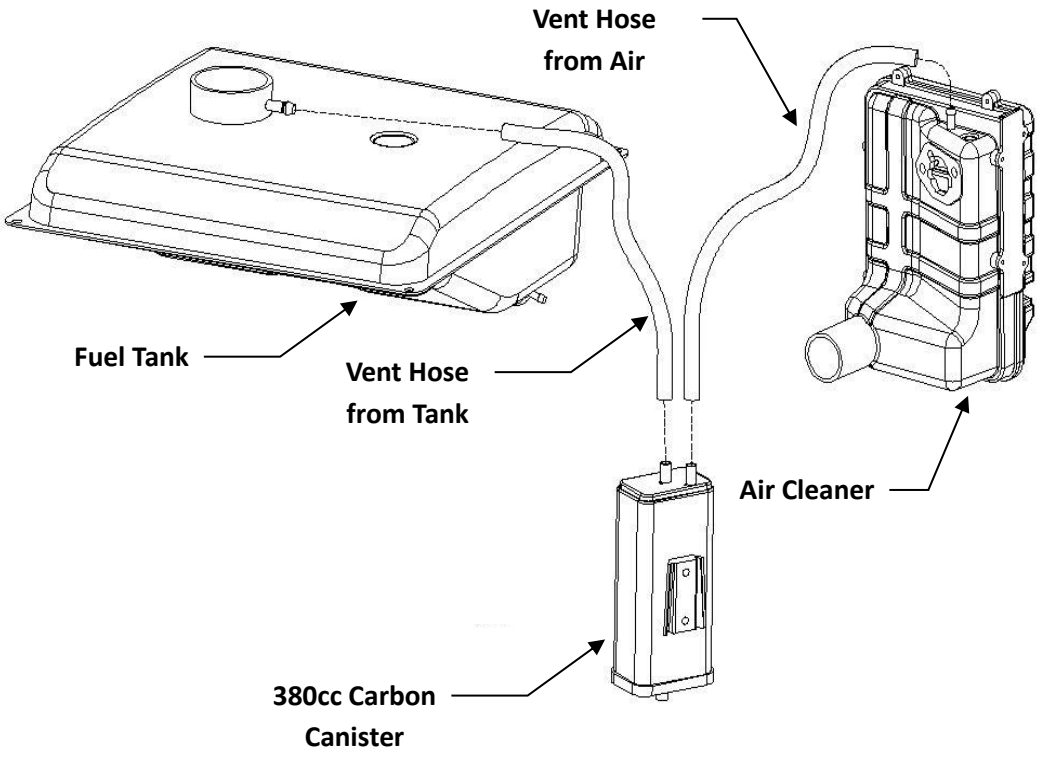
■ Valve clearance inspection and adjustment must be performed with the engine cold.

Inspection/Adjustment:

1. Remove spark plug, valve cover bolt, valve cover and valve cover gasket.



4.8 Evaporation Control System



Rotate the engine in a clockwise direction until the piston is at top dead center and the intake and exhaust valves are closed.

2. Insert a feeler gauge between the rocker arm and the valve and measure the valve clearance.

Valve clearance	Intake	0.10 ± 0.02mm (0.004” ±0.001”)
	Exhaust	0.15 ± 0.02mm (0.006” ±0.001”)

3. If adjustment is necessary, proceed as follows.

a. Secure the rocker arm adjustment screw and loosen the locknut.
b. Adjust the screw until the desired valve clearance is attained.
c. Tighten the locknut and recheck the clearance.

4. Clean the cylinder block and valve cover.
5. Replace the rubber valve cover seal.
6. Install the removed parts in the reverse order of removal.

5. Muffler system

Caution

- Muffler removal / installation must be performed with the engine cold.
- Drain all gasoline from the fuel tank before disassembly.
- Keep the unit away from all heat, flame and sparks.

5.1 Spark arrestor

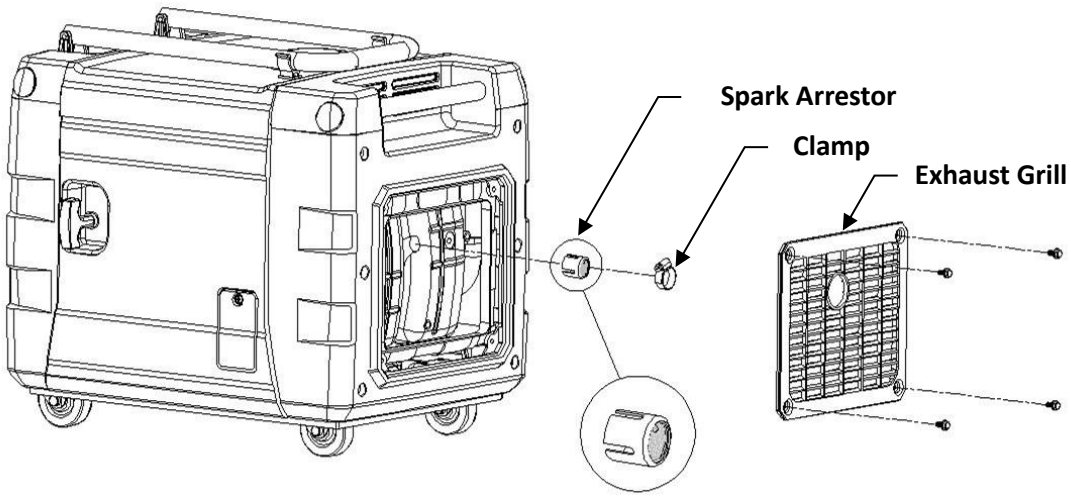
⚠ CAUTION

- If the generator has been running, the muffler will be very hot. Allow it to cool before proceeding.

⚠ NOTE

- The spark arrester must be serviced every 100 hours to maintain its efficiency.

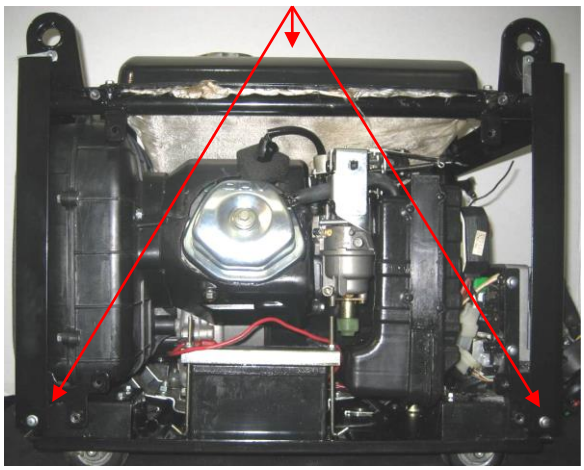
1. Remove the exhaust grill to access the spark arrestor.
2. Remove the clamp holding the spark arrester to the muffler.
3. Clean the spark arrestor with a stiff wire brush.
4. Replace the spark arrestor if the wire mesh is perforated or torn.
5. Reinstall the spark arrester.
6. Reinstall the exhaust grill.

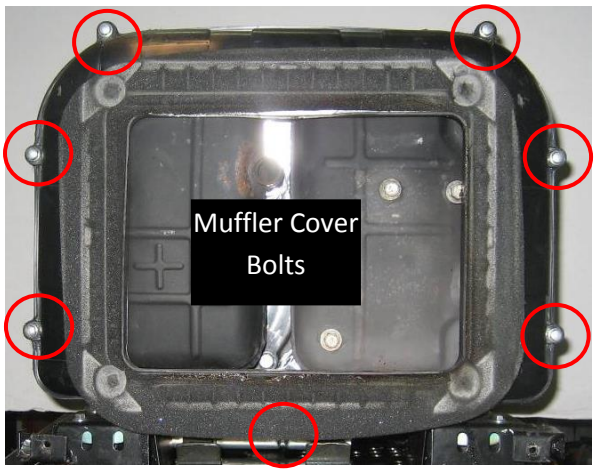


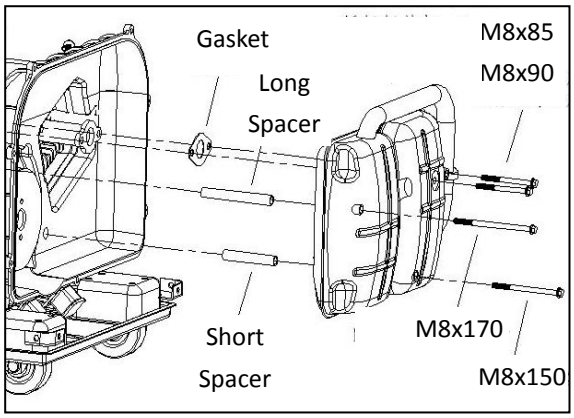
5.2 Muffler

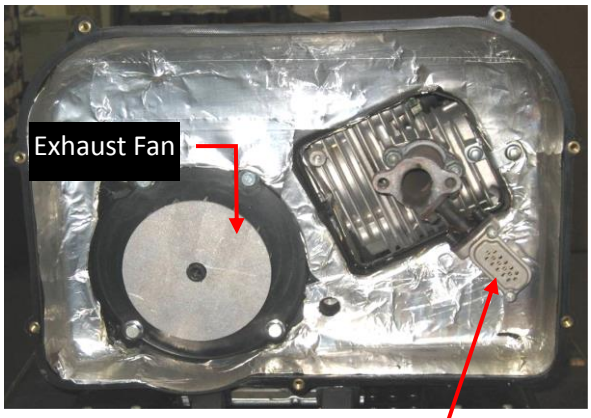
- **Disassembly / Reassembly**
  1. Disconnect battery.
  2. Remove the front and rear end panel, the side panels and the fuel tank cover.
  3. Remove upper frame with fuel tank as one assembly.
  4. Remove the muffler cover.
  5. Remove the muffler. Carefully note the various length bolts and spacers during removal and reassembly.

Upper Frame and Fuel Tank









Secondary Air valve

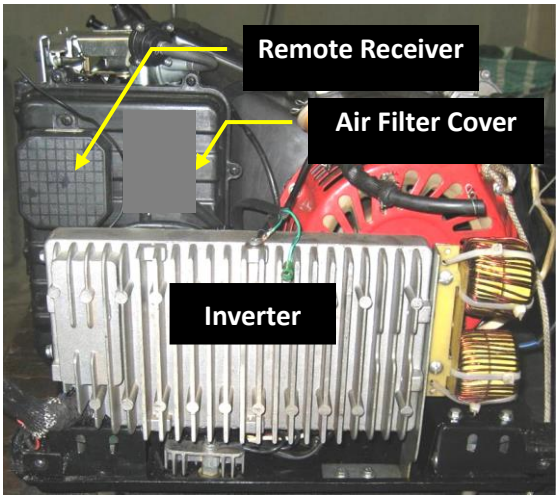
6. Carburetor

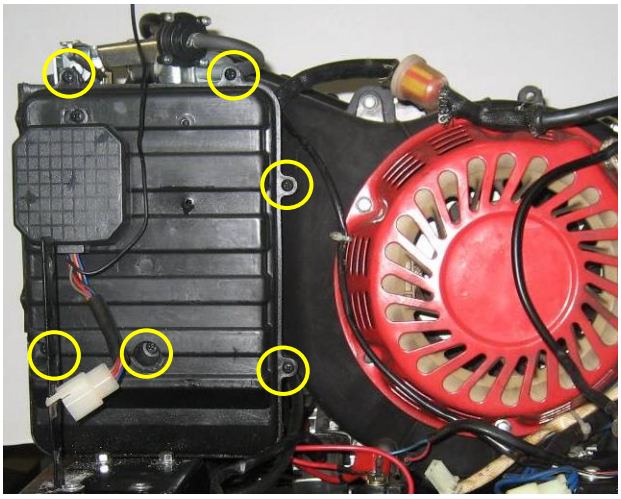
6.1 Disassembly / Installation of Carburetor

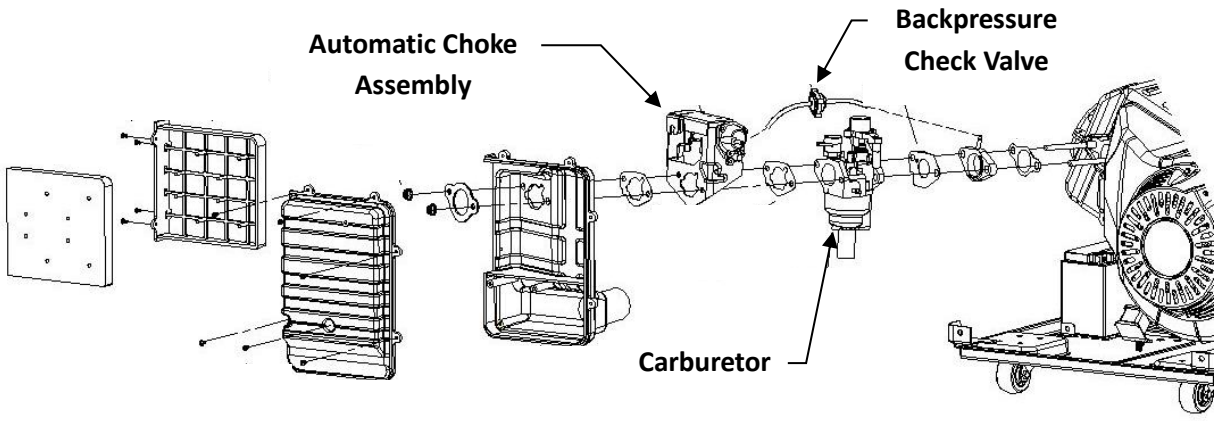
Caution

- Drain all gasoline from the fuel tank and the carburetor before disassembly.
- Keep the unit away from all heat, flame and sparks.

1. Disconnect the battery.
2. Remove the front and rear end panels and left side panel.
3. Remove the inverter.
4. Remove the air filter cartridge and filter.
5. Remove air filter cover screws.
6. Remove flange nuts, retainer plate and air box.
7. Remove the carburetor and choke as an assembly, being careful not to pull on the step motor wires.



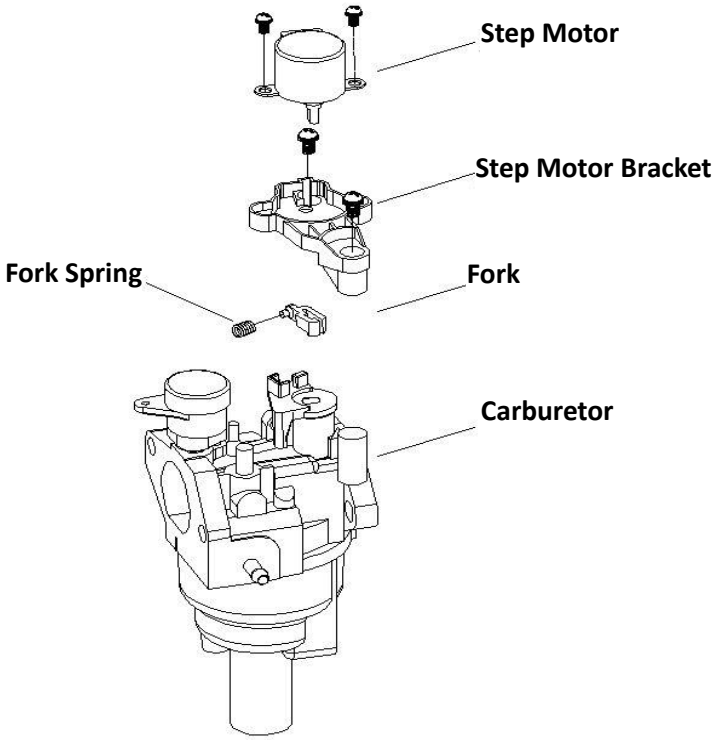




6.2 Disassembly / Installation of Step motor

● Disassembly and installation of step motor

1. Unplug the step motor plug from the inverter.
2. Remove the step motor mounting bracket, being careful not to loosen the fork spring.
3. Remove the throttle fork from the step motor shaft and remove the step motor screws.

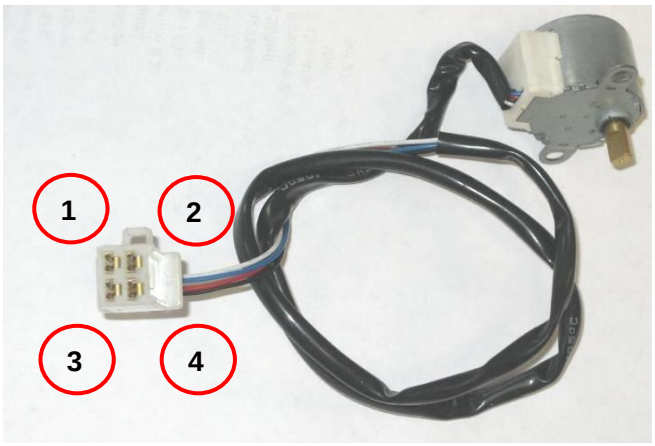


6.3 Step motor inspection

1. Measure the resistance of the outlet terminals of the step motor

Resistance value	Pin 1-blue - Pin 2-white：50-55Ω
	Pin 3-red - Pin 4-black：50-55Ω

2. Replace the step motor if the resistance exceeds the standard value.

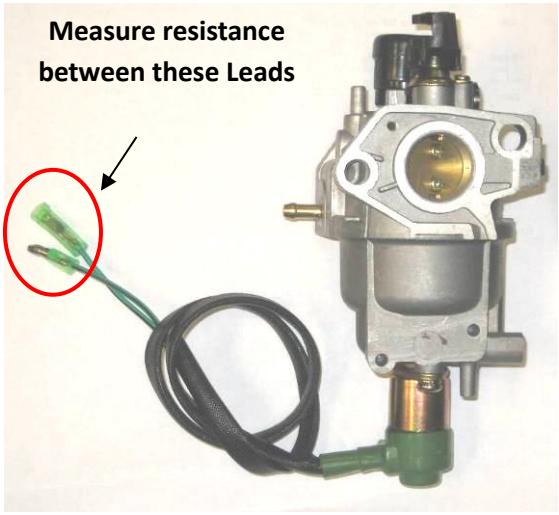


6.4 Fuel shutoff solenoid

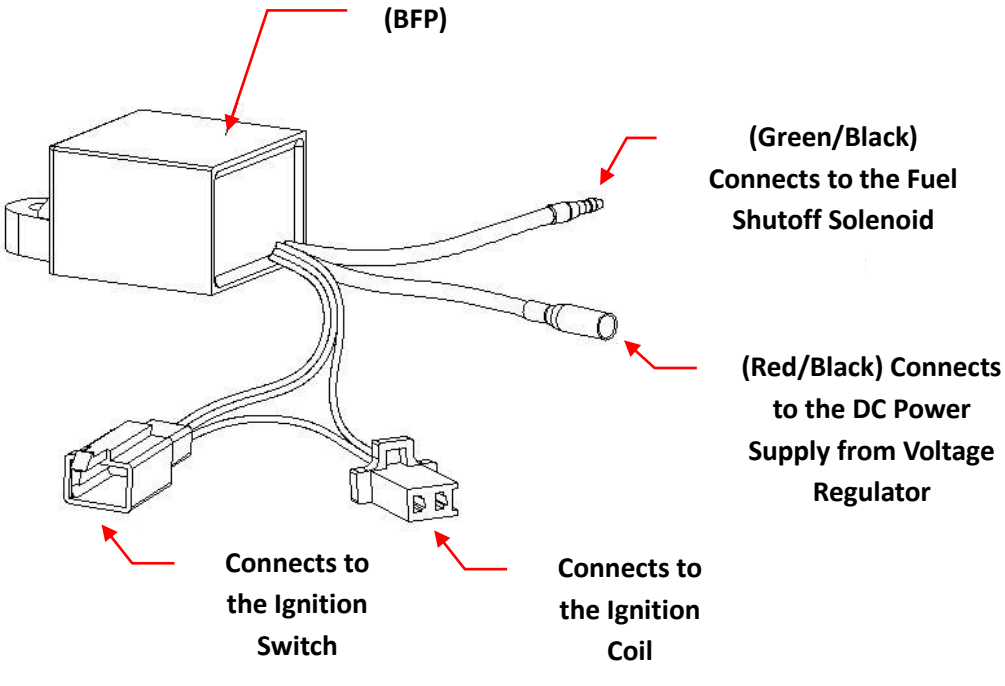
Measure the resistance of fuel shutoff valve between the two leads.

Resistance value	7-9Ω

Replace the electromagnetic valve if the resistance exceeds the standard value.

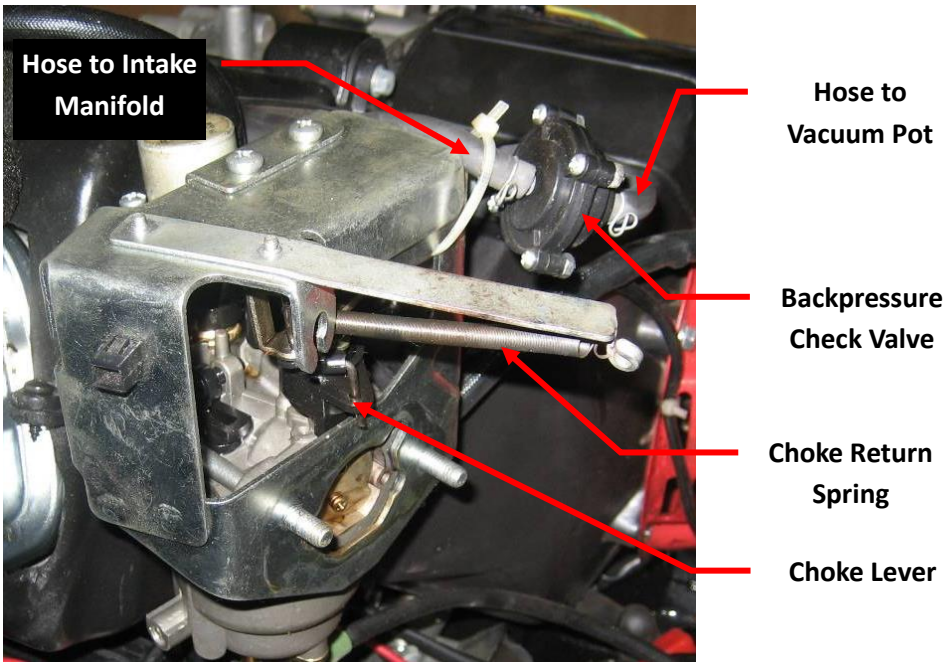


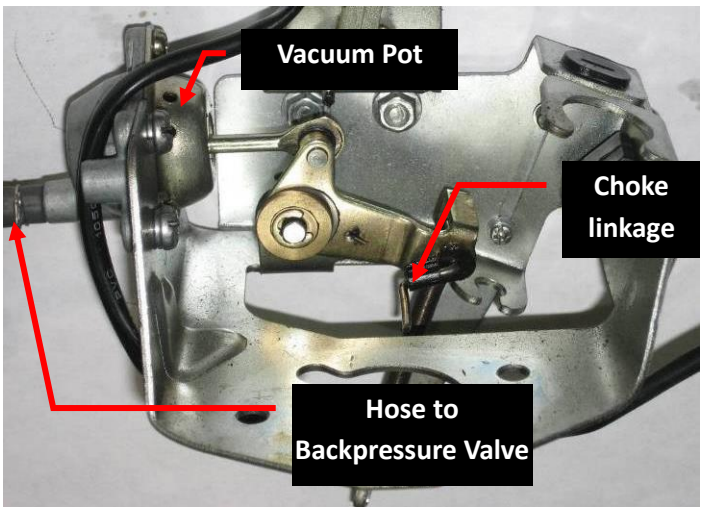
6.5 Backfire controller (BFP)



6.6 Automatic choke assembly.

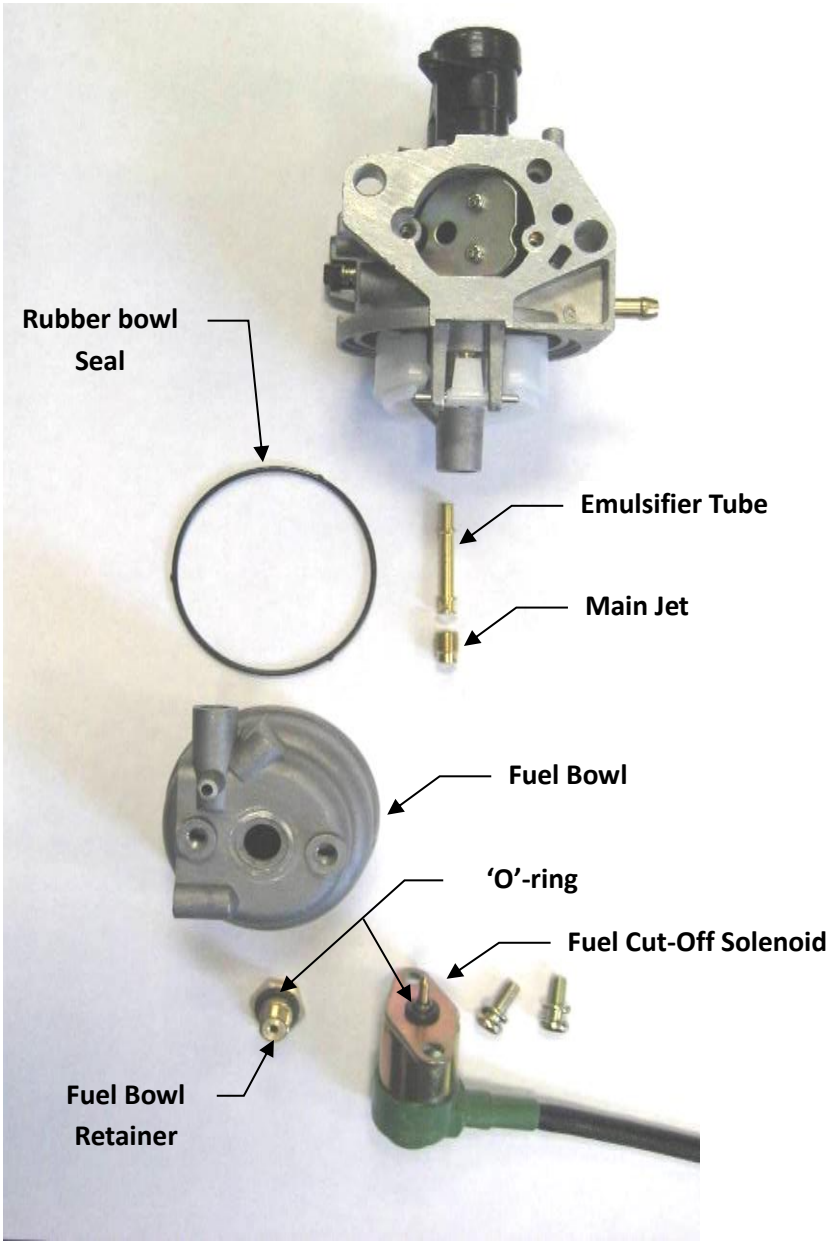
1. The automatic choke consists of the backpressure check valve and the vacuum pot.
2. Items to check if the automatic choke fails to operate.
    a. Check all vacuum hoses for cracks or damage, replace as necessary.
    b. Check the backpressure check valve for leaks or a defective diaphragm.
    c. Check all choke linkage to insure that it operates smoothly and that the choke closes and opens fully.
    d. Check the vacuum pot for leaks. With the lever depressed pinch off or block the end of the hose. The plunger should stay in the retracted position as long as the hose is pinched or closed off.





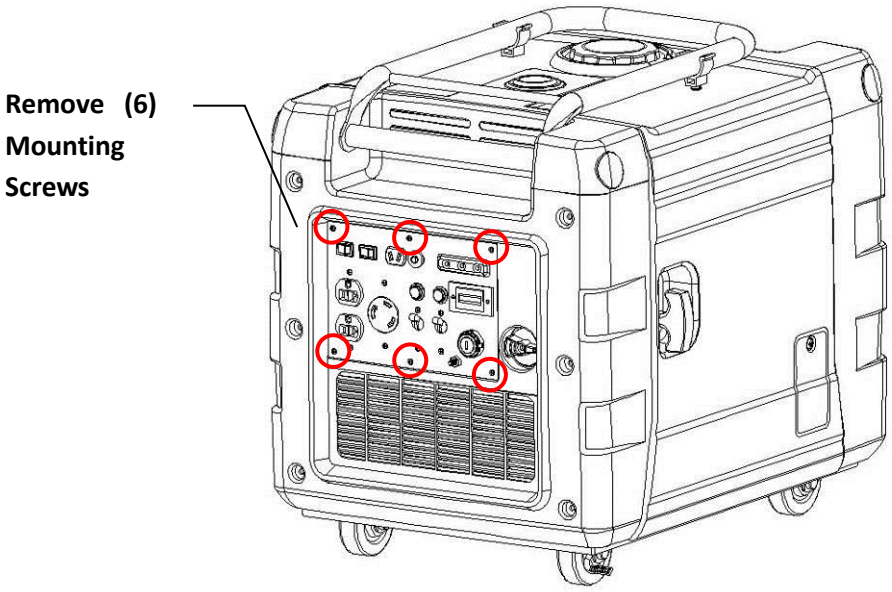
6.7 High Altitude jet installation

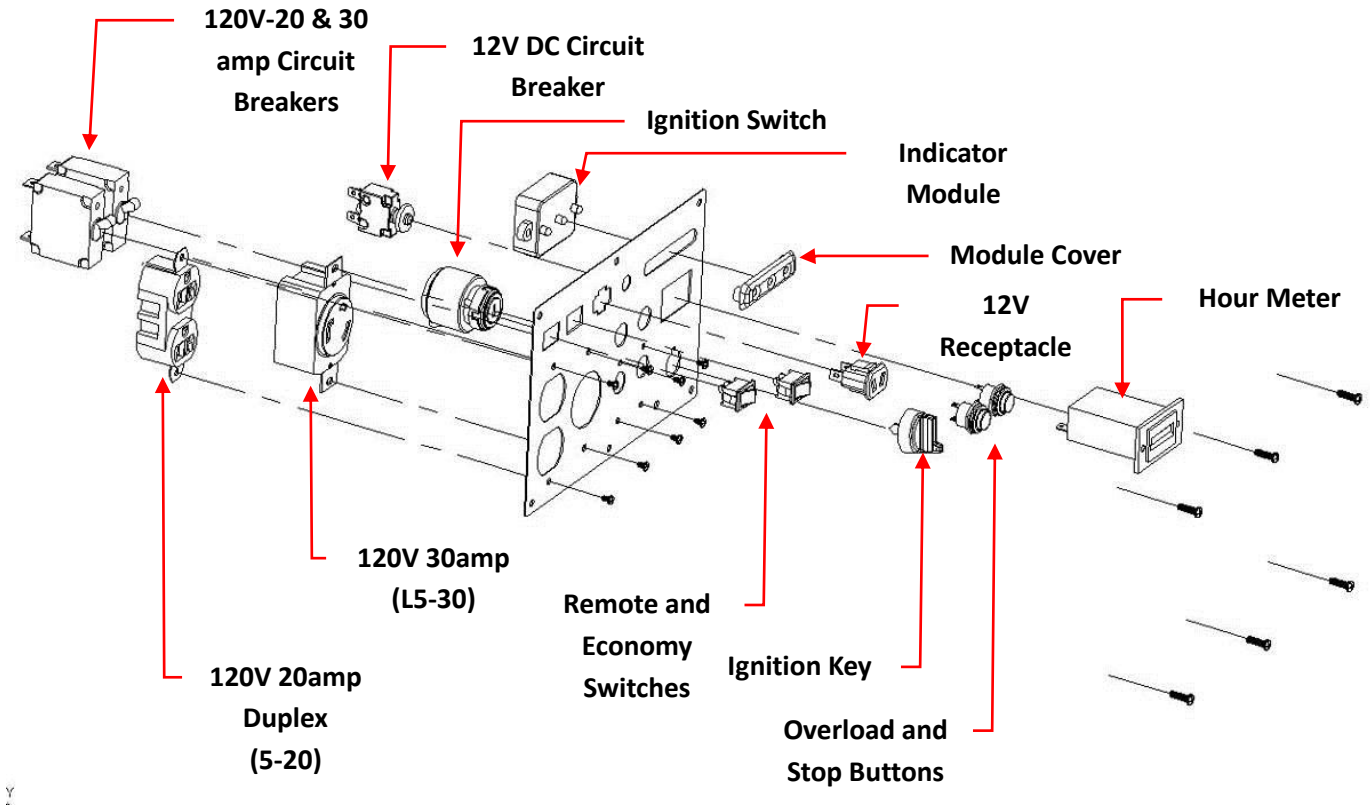
1. Remove the carburetor.
2. Remove the fuel cut off solenoid.
3. Remove the fuel bowl retainer, bowl and gasket.
4. Remove the main jet and emulsifier tube.
5. Carefully inspect all rubber seals and ‘O’-rings.
6. Replace the main jet with a high altitude jet and reassemble carburetor.
7. Reinstall and check for fuel leaks.



7. Control panel

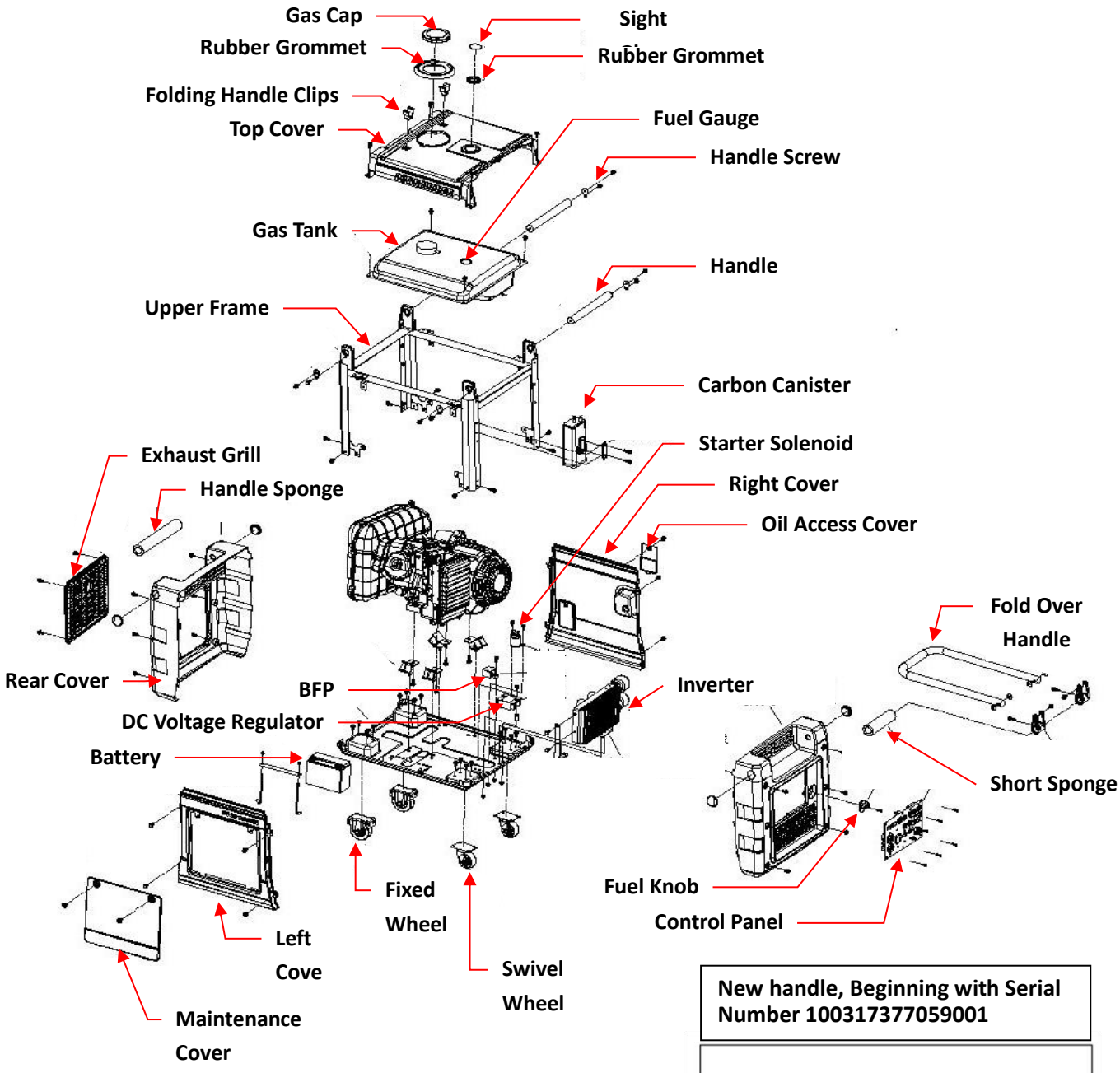
7.1 Disassembly / Installation



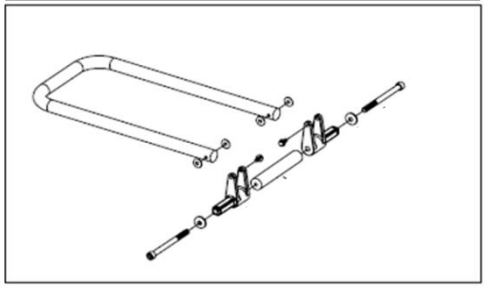


8. Outer generator housing

8.1 Disassembly / Installation



New handle, Beginning with Serial Number 100317377059001

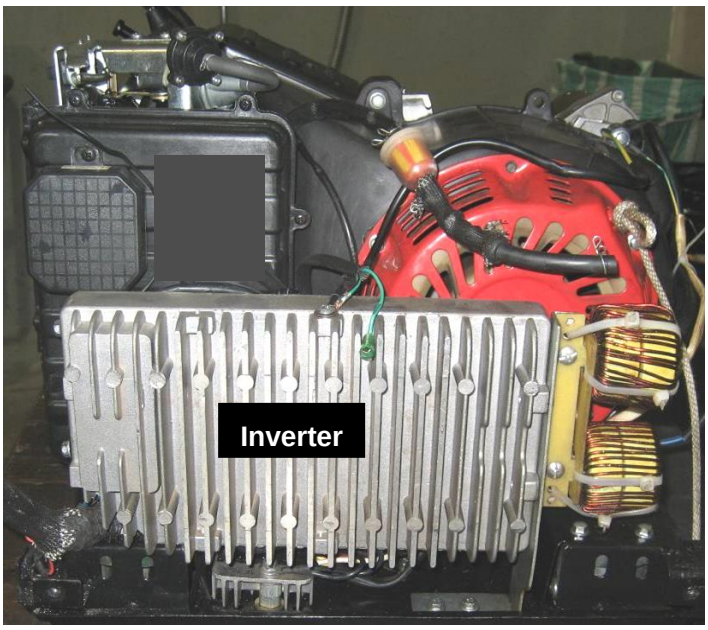


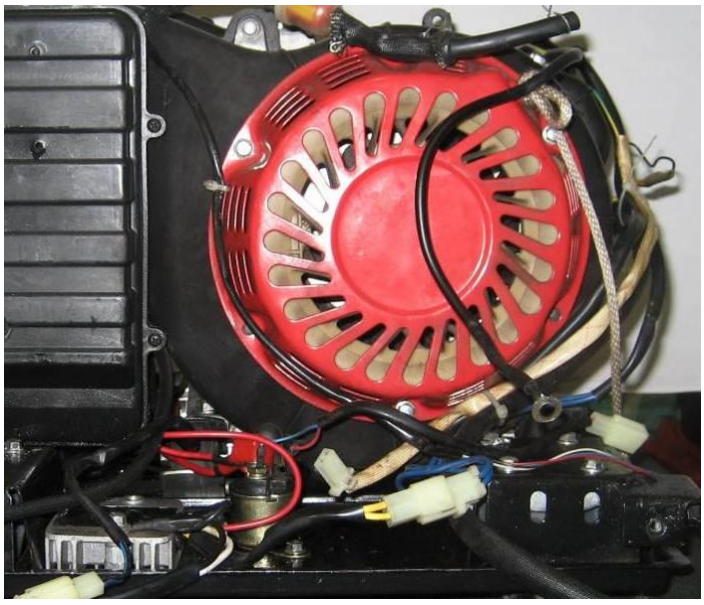
9. Recoil starter / Disassembly / Reassembly

Caution

- Drain all gasoline from the fuel tank before disassembly.
- Keep the unit away from all heat, flame and sparks.

1. Disconnect the battery.
2. Remove front panel.
3. Drain all gasoline from the fuel tank.
4. Remove the inverter.
5. Remove (3) M6 flange bolts and the recoil starter.
6. Reinstall the inverter and end panel.





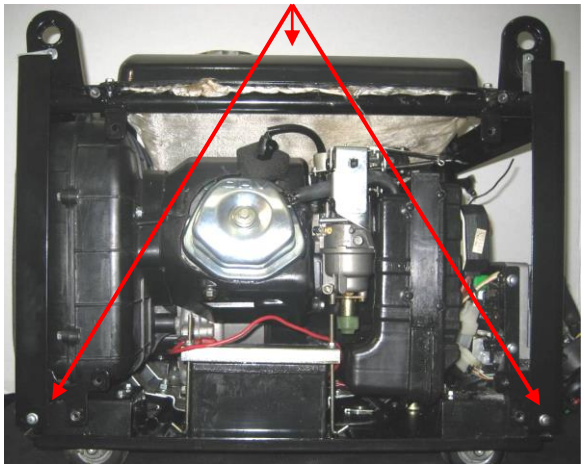
9.1 Inlet Fan Cover

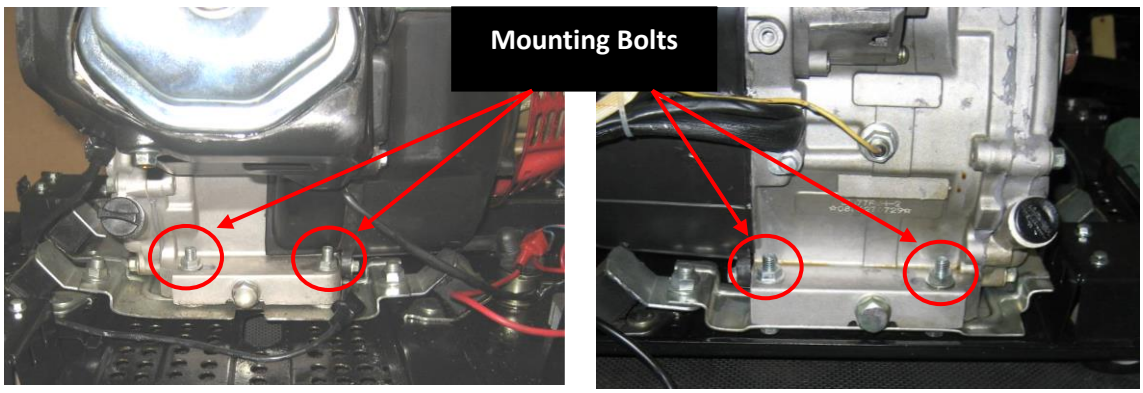
Caution

- ■ Drain all gasoline from the fuel tank before disassembly.
- ■ Keep the unit away from all heat, flame and sparks.

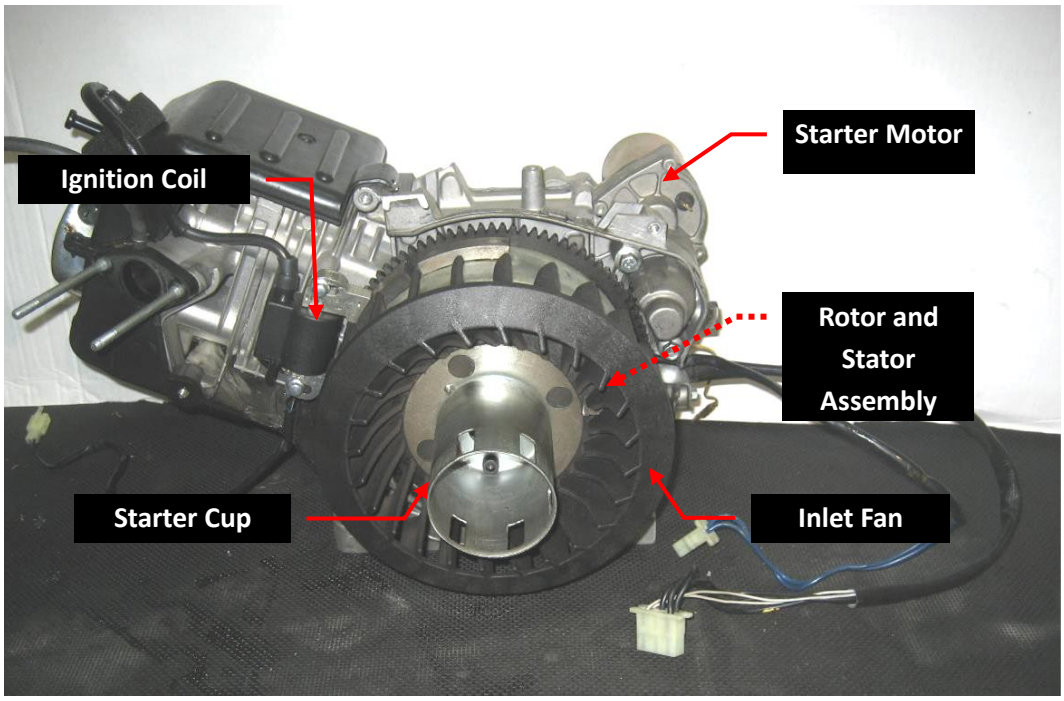
1. Disconnect and remove the battery.
2. Remove the front and rear end panels and the left and right side panels.
3. Remove the upper frame and the gas tank as an assembly.
4. Remove the inverter.
5. Disconnect all wires from the stator assembly.
6. Disconnect the starter motor wire and all ground wires.
7. Remove (4) nuts from the engine mounting bolts (2 on each side) and lift the engine assembly off of the base pan.

Upper Frame and Gas Tank



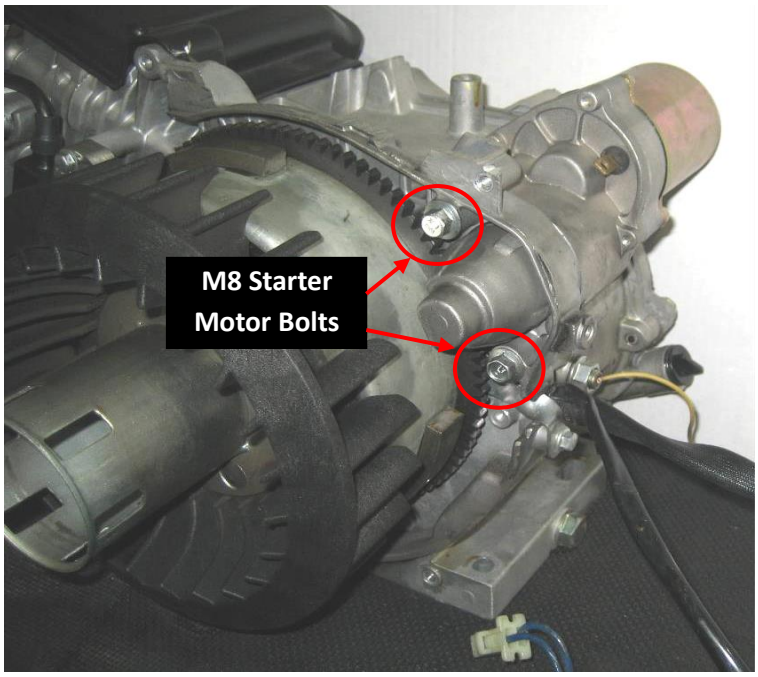


8. Remove the carburetor assembly and the inlet fan cover.



9.2 Starter motor

1. Follow steps 1 through 8 as outlined in section 8.1.
2. Remove (2) M8 flange bolts



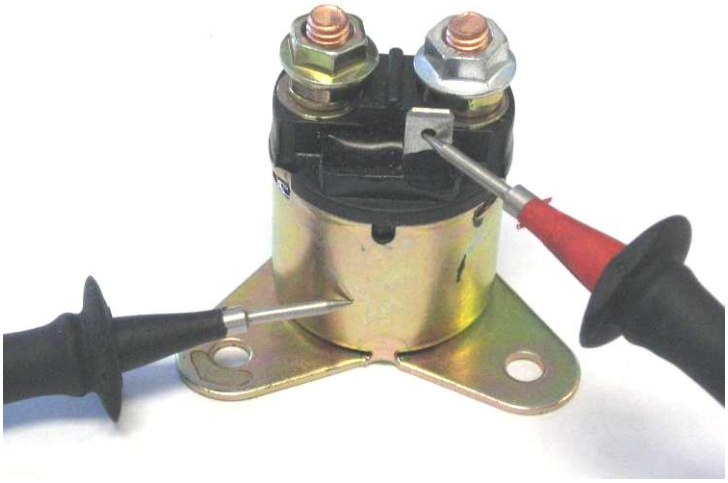
9.3 Start relay

1. Using a volt ohm meter, check the resistances of the electromagnetic coil of the starter relay by connecting the red positive lead to the ¼" spade and the black negative lead to the metal body of the relay.

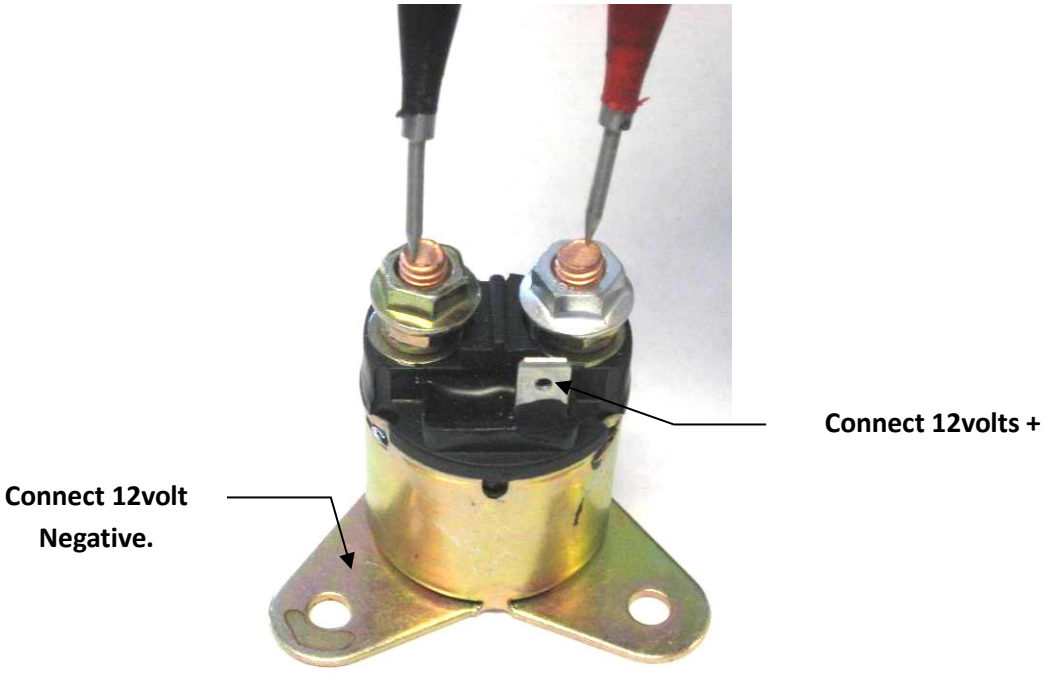
Resistance	5.4 Ω ± 10%

2. Check the function of the start relay by connecting 12 volts + to the ¼" spade terminal and 12 volts negative to the metal base or body. There should be a clicking sound as the relay is activated. While the relay remains activated, use the volt ohm meter check continuity between the two lugs. If there is no continuity the relay is defective.
3. **Note, there must only be continuity between the battery and starter terminals when the relay is activated.**

Checking Resistance



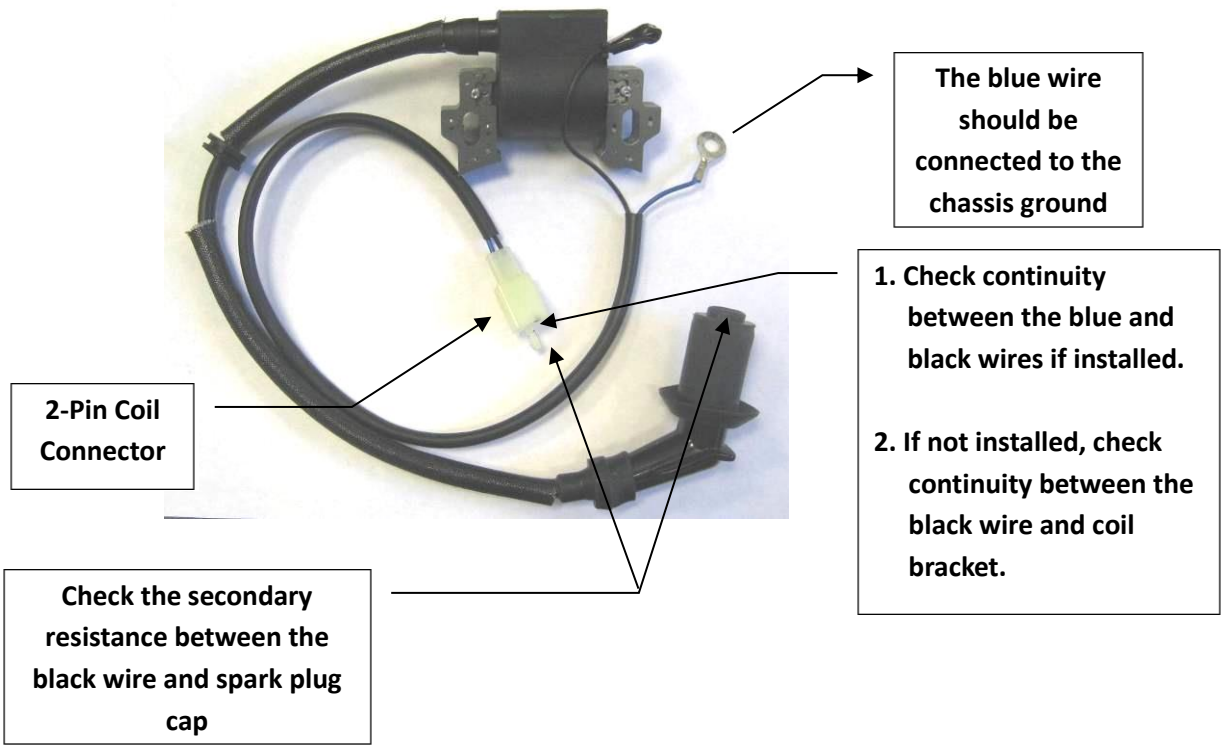
Checking Continuity



9.4 Ignition coil Inspection

1. Remove the control panel and locate the 2-pin primary coil plug with a Blue and Black wire and unplug it from the control panel.
2. Attach the two leads of the tester to the Blue and Black wires and measure the primary resistance of the ignition coil.
3. If there is no resistance, check for continuity between the Blue wire and chassis ground. If there is no resistance repair or correct as necessary.
4. Replace the coil if there is no resistance or the value is outside of the values shown.

Primary resistance	1.4-2.0Ω


The blue wire should be connected to the chassis ground
1. Check continuity between the blue and black wires if installed.
2. If not installed, check continuity between the black wire and coil bracket.
2-Pin Coil Connector
Check the secondary resistance between the black wire and spark plug cap

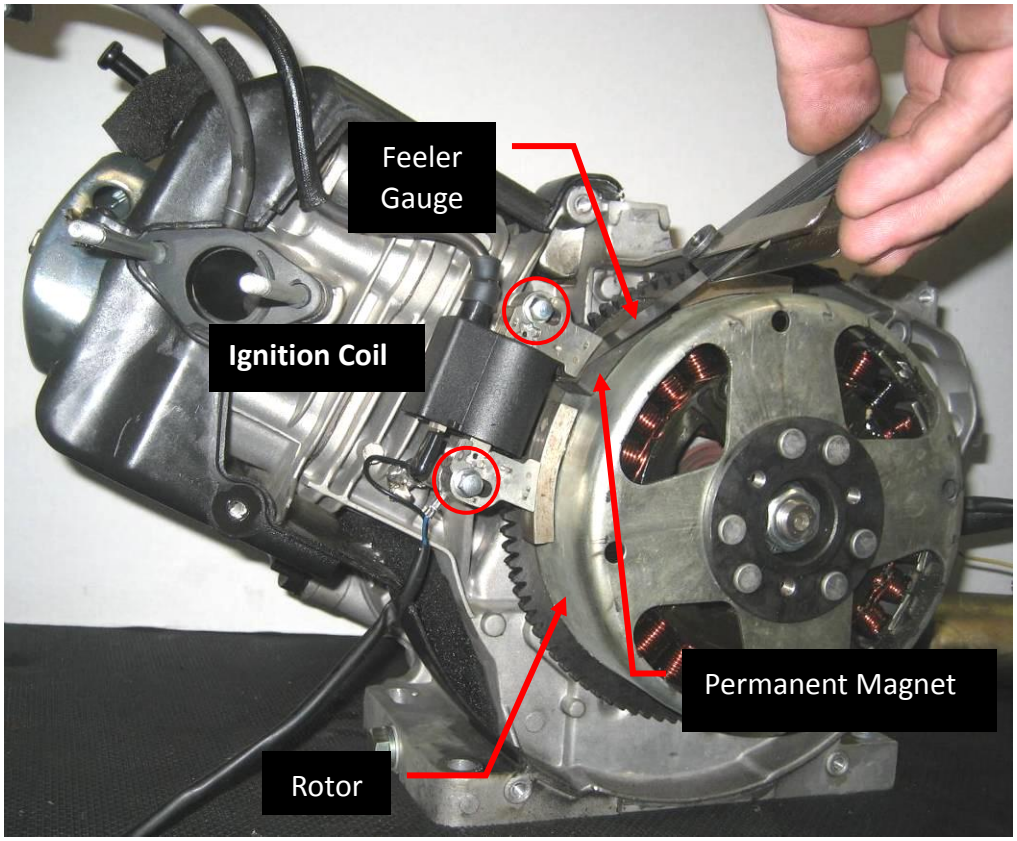
5. To check the secondary resistance, attach one lead of the tester to the black wire of the primary plug of the ignition coil and the other lead to the spark plug cap.
6. If there is no resistance remove the spark plug cap and check the lead itself .
7. Replace the spark plug cap or coil if there is no resistance or the value is outside of the values shown.

Secondary resistance	11.0-15.0kΩ

9.5 Ignition coil Adjustment / Replacement

1. Follow step 1 through 8 as outlined in section 8.1.
2. Adjust the clearance between the ignition coil and the outer magnet trigger of the rotor.
3. Loosen the ignition coil bolts and Insert a feeler gauge between the ignition coil and the permanent magnet of the rotor, (Both sides need to be adjusted equally) and retighten the bolts.
4. Rotate the rotor to make sure there is no interference with the flyweights.

Ignition coil clearance	0.6-0.8mm (0.024”-0.032”)



10. Stator and Rotor disassembly / reassembly

10.1 Stator Inspection

1. Disconnect and remove the battery.
2. Remove the front panel.
3. Remove the inverter.
4. Locate the 6-pin connector at the inverter and unplug it.
5. Locate the two pin connector from the stator and unplug it from the voltage regulator.

DC charging windings

Measure the resistance between the two blue terminals at the 2-pin connector.

Resistance	Blue-Blue
	0.045-0.070 Ω

Sub windings

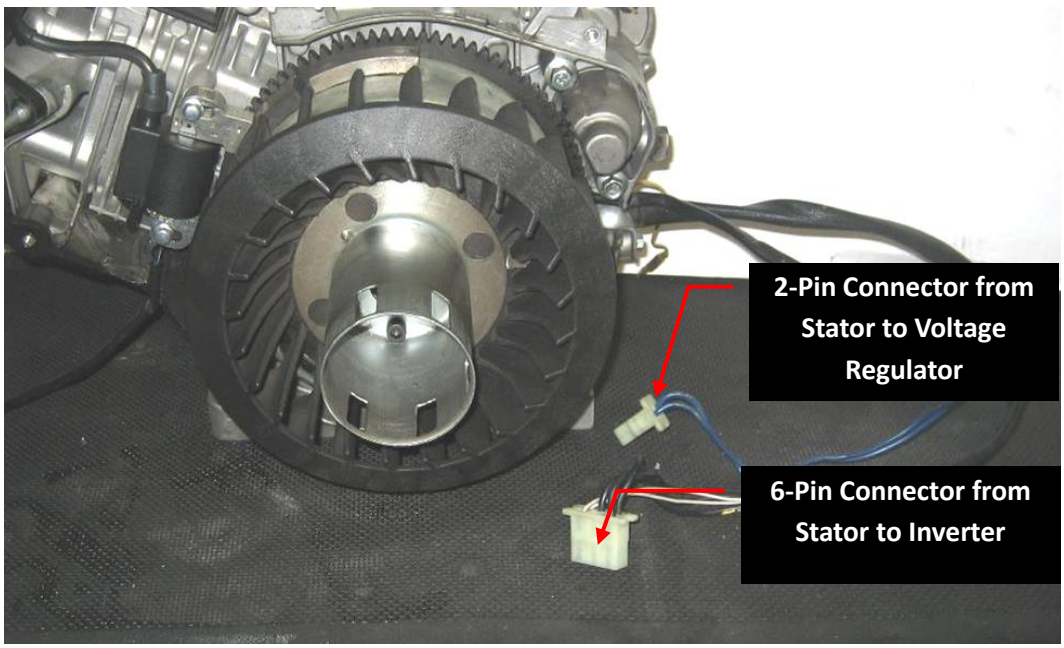
Measure the resistance between the two sub winding terminals at the 6-pin connector.

Resistance	White-White
	0.10-0.16 Ω

Main windings

Measure the resistance between each of the main winding terminals at the 6-pin connector.

Resistance	Black-Black-Black
	0.25-0.35 Ω

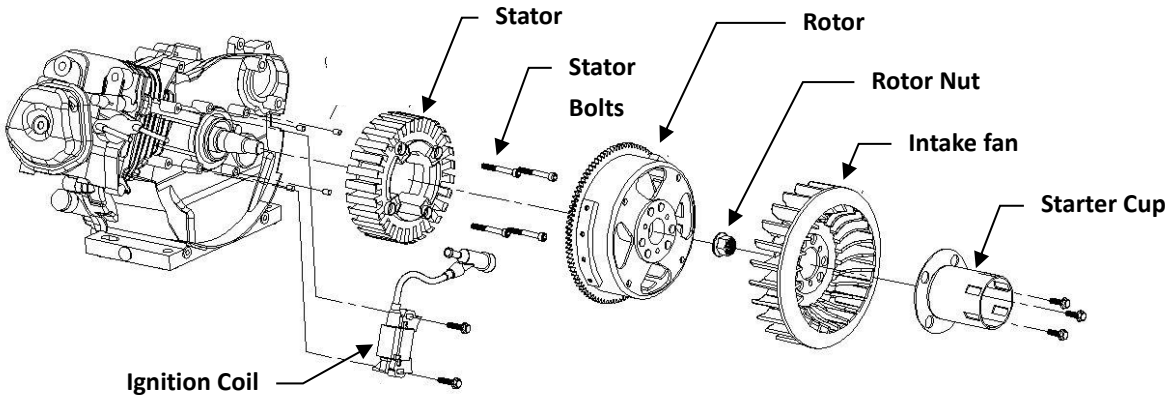


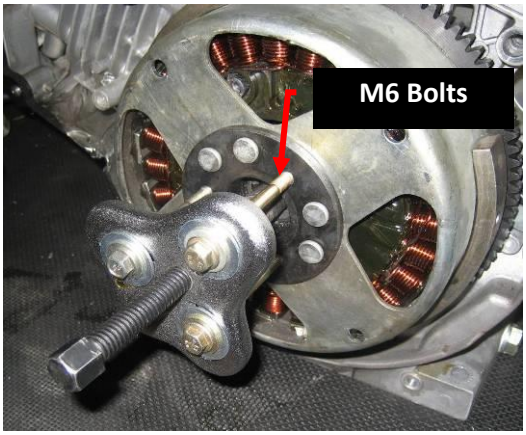
10.2 Stator Removal/Reassembly

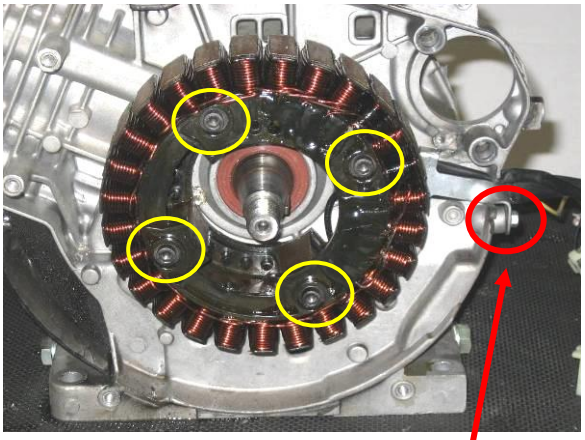
Caution

- Drain all gasoline from the fuel tank before disassembly.
- Keep the unit away from all heat, flame and sparks.

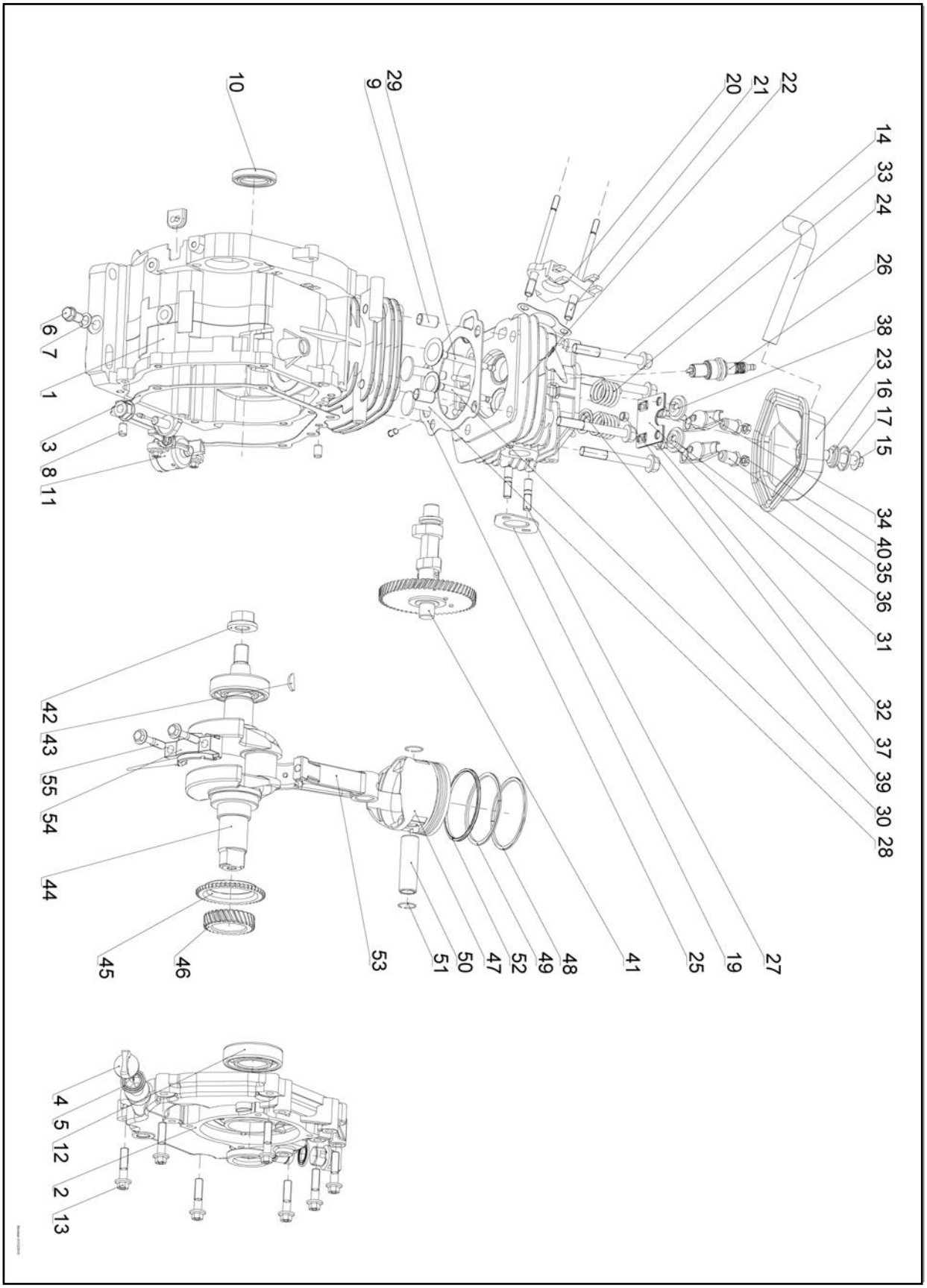
1. Disconnect and remove the battery.
2. Remove the front and rear end panels and the left and right side panels.
3. Remove the upper frame and the fuel tank as an assembly.
4. Remove the inverter.
5. Disconnect all wires from the stator assembly.
6. Disconnect the starter motor wire and all ground wires.
7. Disconnect the BFP controller from the ignition coil and carburetor.
8. Remove (4) nuts from the engine mounting bolts (2 on each side) and lift the engine assembly off of the base pan.
9. Remove the ignition coil, starter cup and fan.
10. Remove the M16 cap nut from the crankshaft.
11. Attach the appropriate puller to the rotor using 3-M6 bolts (grade 8.8 or better) and remove the rotor.
12. Remove the cable retainer clip and (4) stator mounting bolts using a M5 Allen wrench.
13. Reverse the procedure to reassemble







11. Exploded engine view



177 Engine Parts List

NO	Description	ERP NO	Stk No.	Qty
1	Crankcase	177010010300		1
2	Crankcase end plate	14000N08F000		1
3	Engine cover gasket	26201N08F000	69258	1
4	Dipstick	14216K07F000	69259	1
5	Dipstick gasket	35100005B31F000	69260	2
6	Drain bolt	26202J01F000		2
7	Drain bolt gasket	26203J01F000		2
8	Guide pin	26028G03F000		2
9	Guide pin 2	14206Q01F000		2
10	Oil seal 30x46x8	26133N08F000	69261	2
11	Low oil sensor	26350Q01F000	69262	1
12	Main bearing	B12016620650		2
13	M8x35 hex bolt	B01070803562		7
14	Cylinder head bolt	30504Q01F000		4
15	Valve cover bolt	30502Q01F000		1
16	Seal	30522Q01F000	69263	1
17	Spacer	30538Q01F000		1
18	Cylinder bottom cover plate	N/A		
19	Exhaust gasket	09080040	69472	1
20	Carburetor mounting block	09080013	69546	1
21	Mounting block stud	30520N08F000		2
22	Cylinder head	30730N08F000	69264	1
23	Valve cover	30700Q01F000	69265	1
24	Breather hose	30713Q01F000		1
25	Valve cover gasket	30503N08F000	69266	1
26	Spark plug, F7RTC	09080151	69537	1
27	Intake mounting studs	30521K07F000		2
28	Valve tappet	30312Q01F000	69267	2
29	Intake valve	30103N08F000	69268	1
30	Exhaust valve	30201N08F000	69269	1
31	Guide plate	177010010600	69558	1
32	Valve adjustment screw	30303Q01F930	69560	2
33	Valve spring	30101Q01F000	69561	2
34	Rocker arm	30301Q01F000	69562	2
35	Rocker arm shaft	30313Q01F000		2
36	Exhaust valve retainer	30106Q01F000	69563	1
37	Exhaust valve cap (1)	30214Q01F000		1
38	Intake valve spring cup	30203Q01F000	69564	1
39	Exhaust valve sping cup (2)	30105Q01F000	69568	1
40	Valve clearance adjusting nut	30302Q01F930	69569	2
41	Camshaft assembly	30400Q01F000		1
42	Flywheel Nut	15230Q01F000		1
43	Key	15116Q01F000	69571	1
44, 45, 46	Crankshaft, assembly	177010400200		1
45	Crankshaft big gear	15207N08F000		1
46	Crankshaft small gear	15237N08F000		1

177 Engine Parts List

NO	Description	ERP NO	Stk No.	Qty
47, 48, 49, 52	Piston w/ rings	15100N08FF10		1
48	Fist air ring	15103N08F000		1
49	Second air ring	15104N08F000		1
50	piston pin	15105N08F000		1
51	piston pin clip	15106K07F000		2
52	Oil control ring	15300N08F000		1
53	Connecting rod	15131N08F000		1
54	Connecting rod cover	15132N08F000		1
55	Connecting rod bolt	15133Q01F930		2

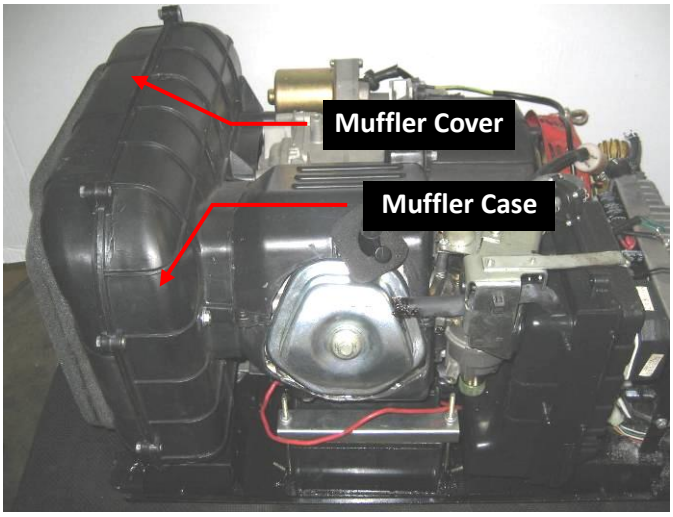
12. Valve cover / Rocker arm

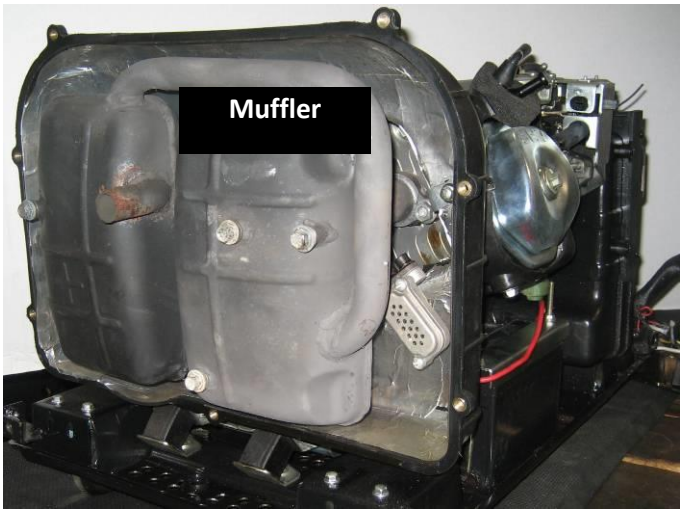
12.1 Cylinder Head Removal

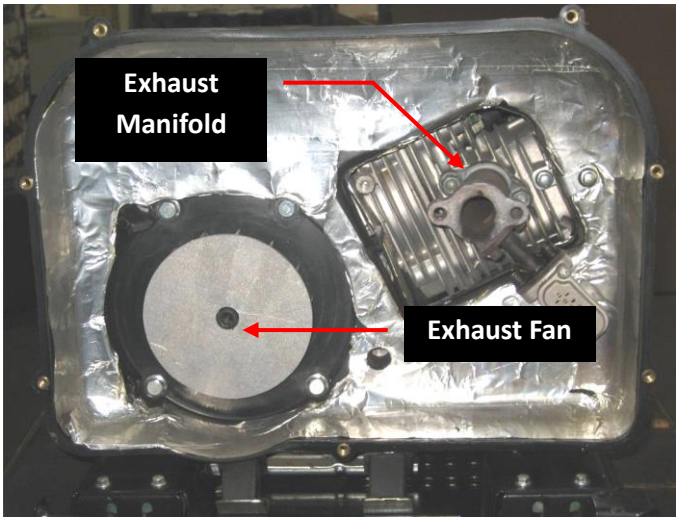
Caution

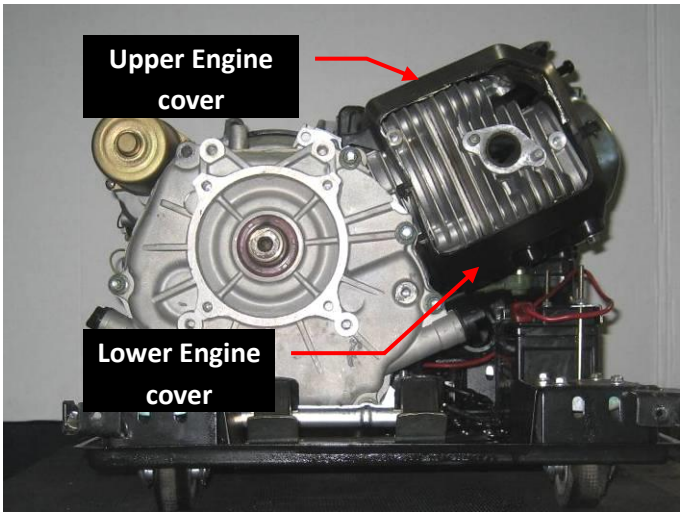
- Drain all gasoline from the fuel tank before disassembly.
- Keep the unit away from all heat, flame and sparks.

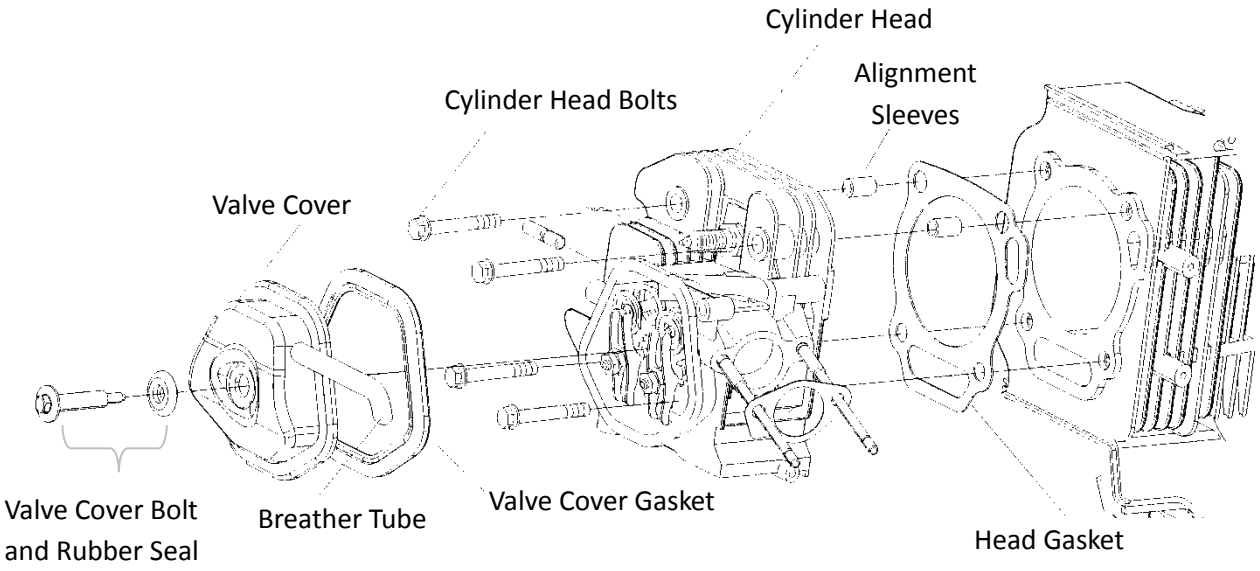
1. Disconnect and remove the battery.
2. Remove the front and rear end panels and the left and right side panels.
3. Remove the upper frame and the fuel tank as an assembly.
4. Remove the inverter and the carburetor assembly.
5. Remove the muffler cover, muffler, exhaust fan, exhaust manifold and muffler housing.
6. Remove the upper and lower engine covers.
7. Remove the valve cover and (4) - M10 head bolts.



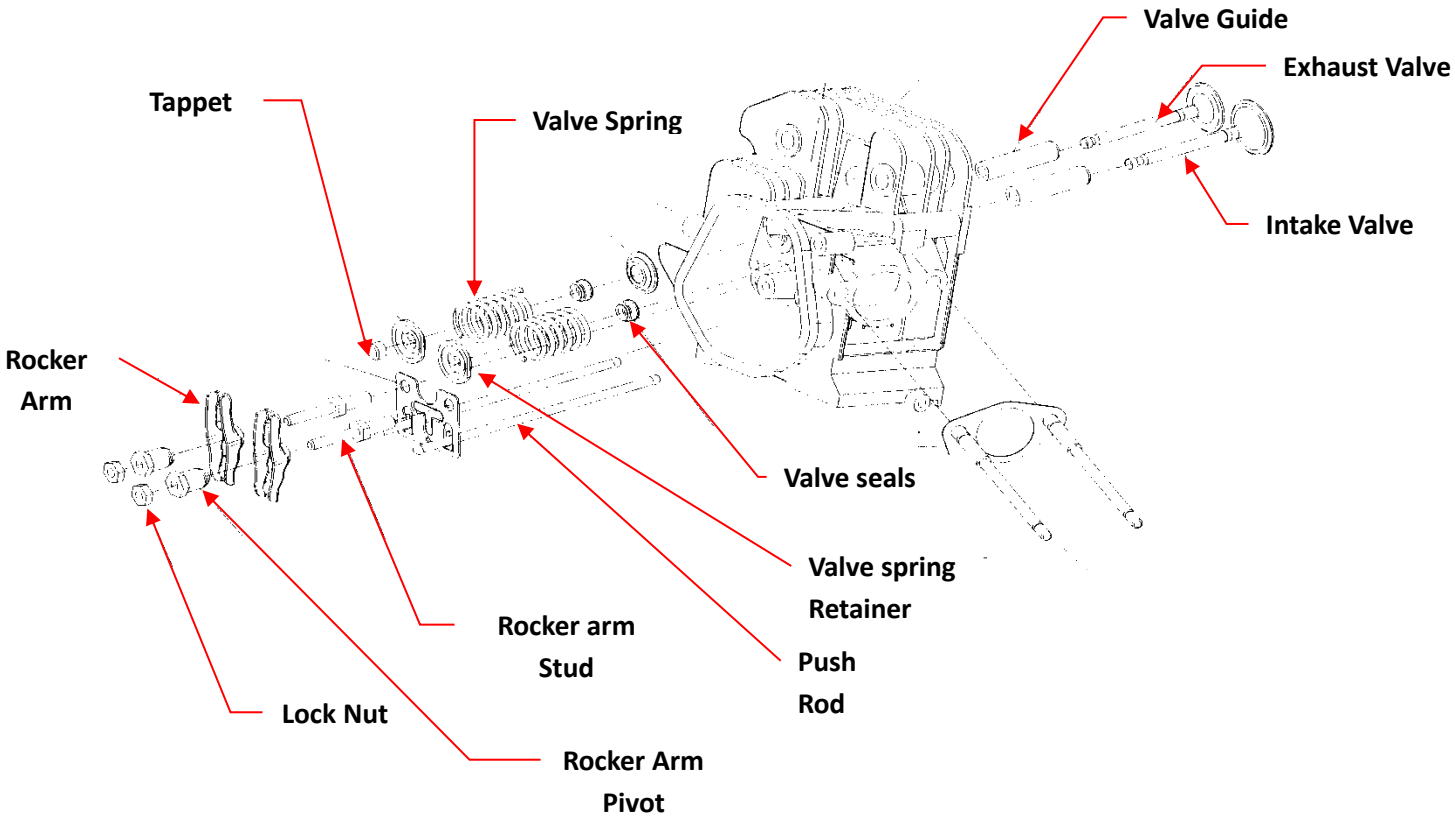








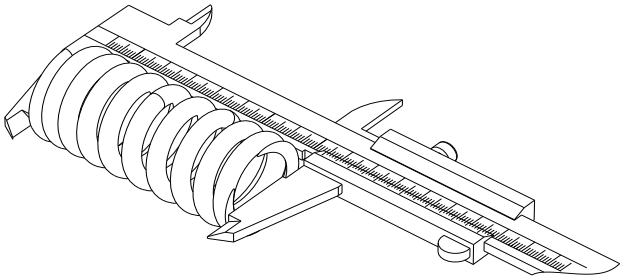
12.2 Cylinder Head Disassembly and Reassembly



12.3 Inspection

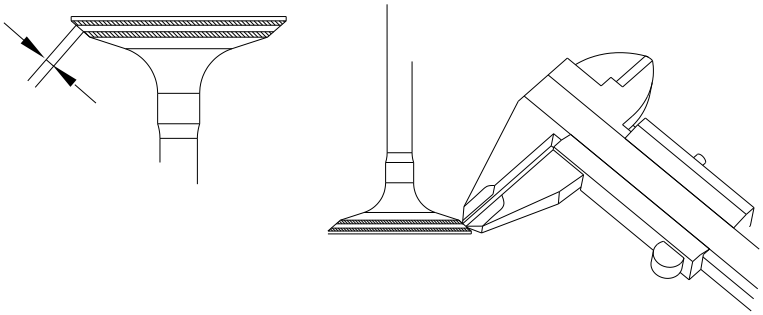
- **Free length of valve spring**

Standard	Service limit
39.1mm (1.54”)	37.5mm (1.48”)



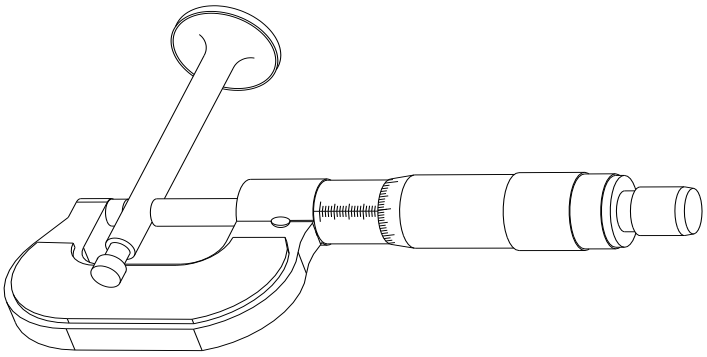
- **Valve seat width**

Standard	Service limit
0.8mm (0.03”)	1.8mm (0.07”)



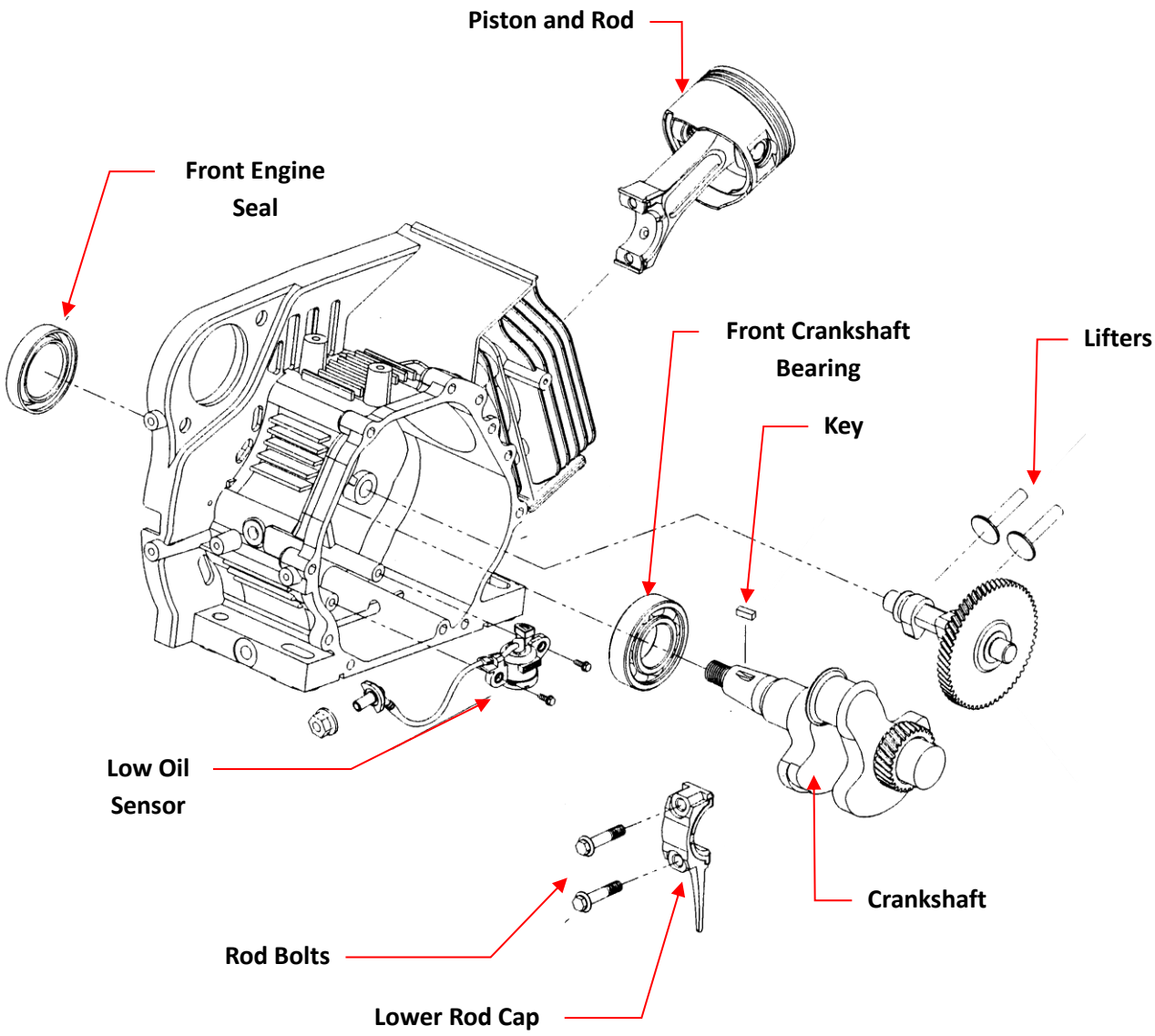
- **Valve stem outer diameter**

	Standard	Service limit
Inlet valve	6.465-6.480mm (0.2545”-0.2551”)	6.40mm (0.2520”)
Exhaust valve	6.455-6.470mm (0.2541”-0.2547”)	6.40mm (0.2520”)



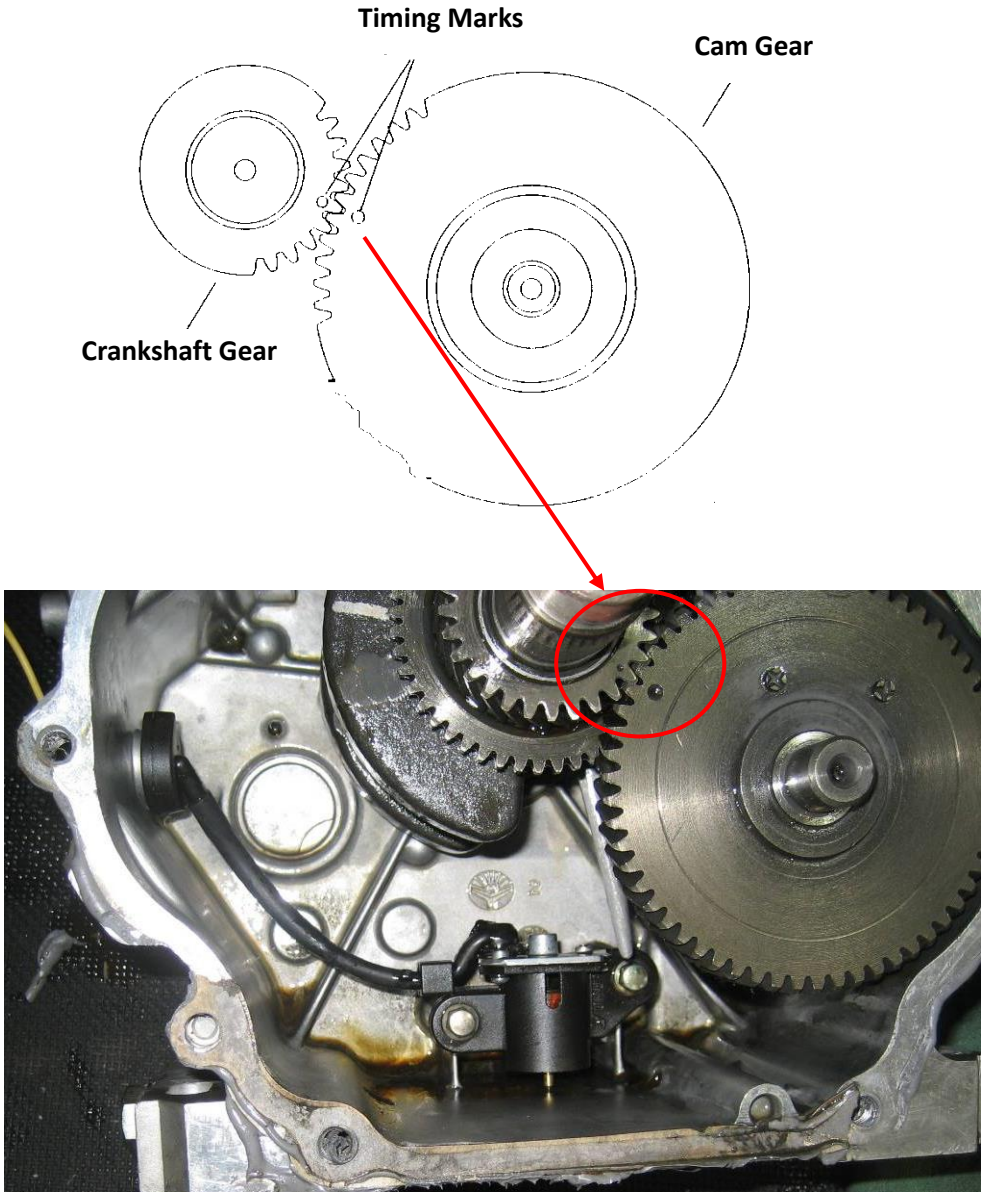
13. Crankshaft / Piston

13.1 Crankshaft, camshaft and piston



13.2 Alignment of timing marks

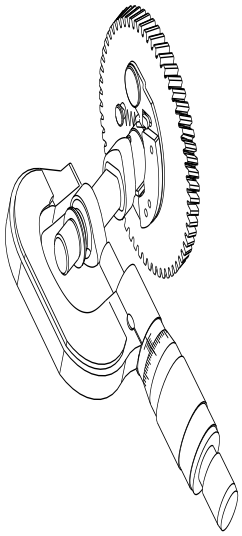
Use marks to align camshaft gear and timing gear during installation.



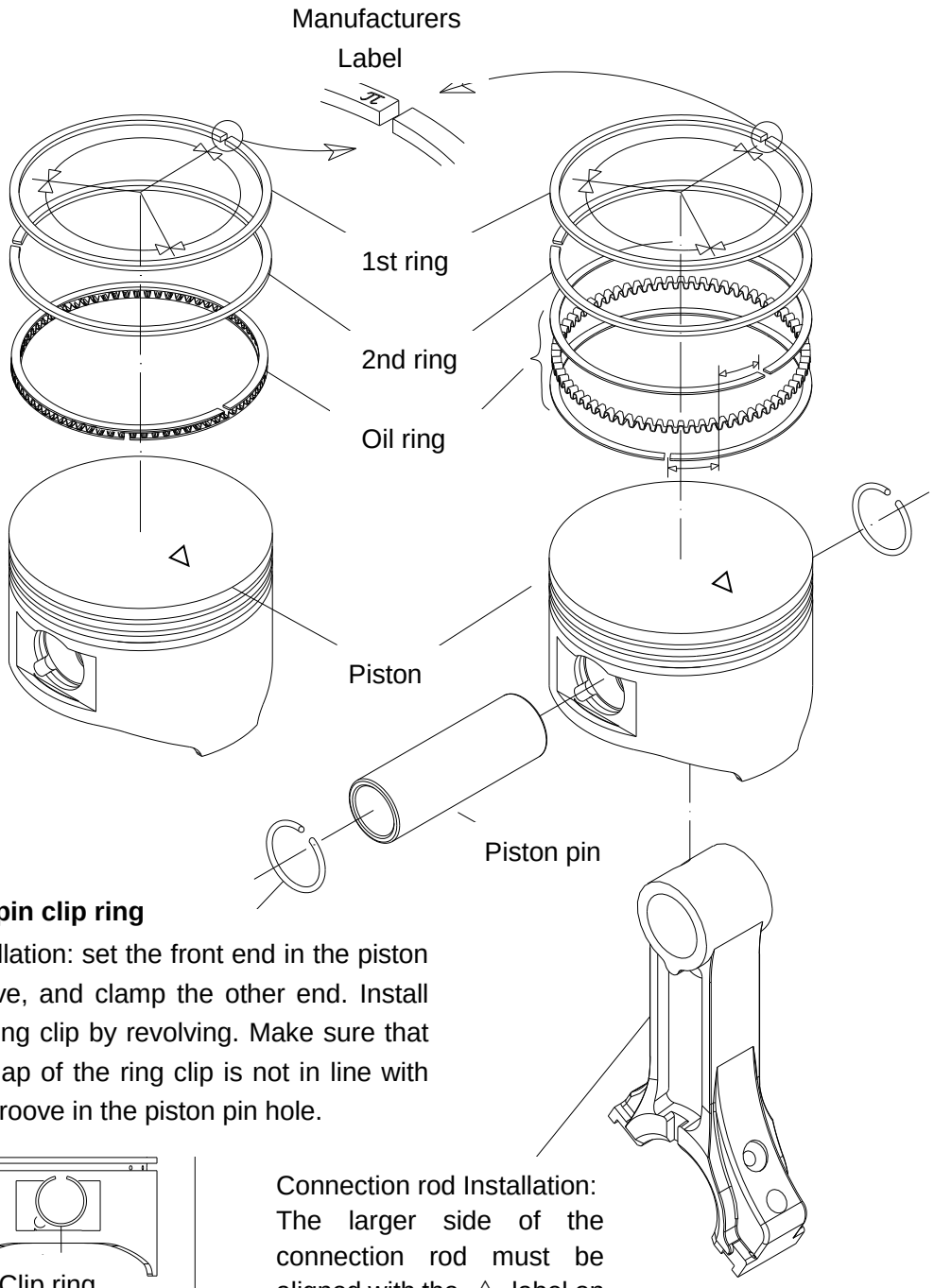
13.3 Camshaft Inspection

- **Height of camshaft**

	Standard	Service limit
Intake/Exhaust	31.700-31.780mm (1.2480”-1.2512”)	31.0mm (1.2205”)

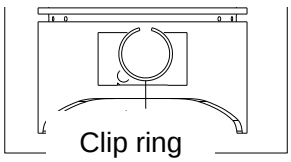


13.4 Piston / Connection rod



Piston pin clip ring

Installation: set the front end in the piston groove, and clamp the other end. Install the ring clip by revolving. Make sure that the gap of the ring clip is not in line with the groove in the piston pin hole.

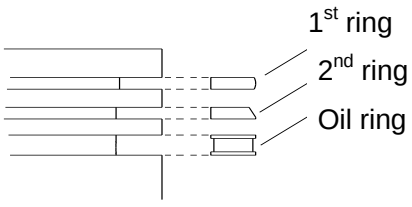


Connection rod Installation: The larger side of the connection rod must be aligned with the △ label on the piston.

Assembly of piston rings

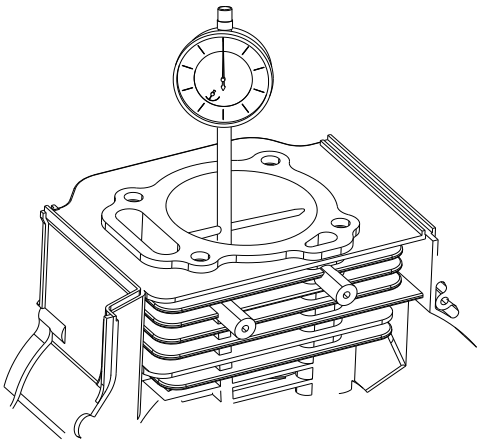
Caution

- Make sure the rings are installed with the manufacturer's label up.
- Make sure the 1st ring and 2nd ring are not interchanged.
- Make sure the piston rings are free to move after installation.
- Stagger each piston ring gap 120° from each of the other rings.



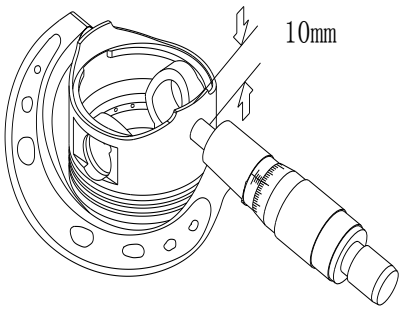
● **Cylinder inner diameter**

Standard	Service limit
77.000-77.020mm (3.0315”-3.0323”)	77.105mm (3.0356”)



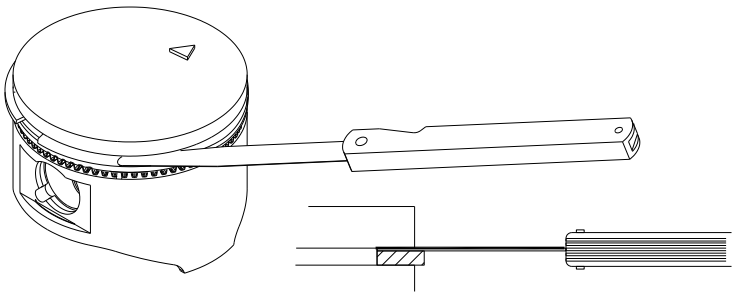
● **Piston skirt outer diameter**

Standard	Service limit
76.960-76.980mm (3.0299”-3.0307”)	76.85mm (3.0256”)



● **Side clearance of piston ring**

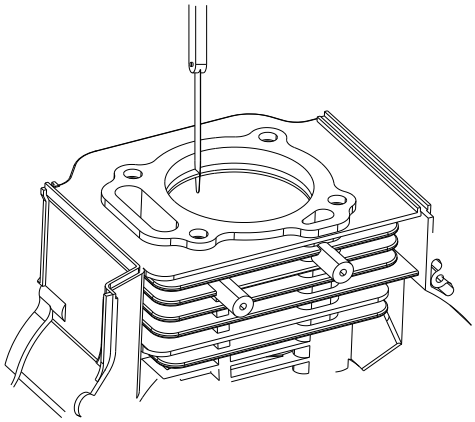
Standard	Service limit
0.02-0.06mm (0.001”-0.002”)	0.15mm (0.006”)



● **Piston ring end clearance**

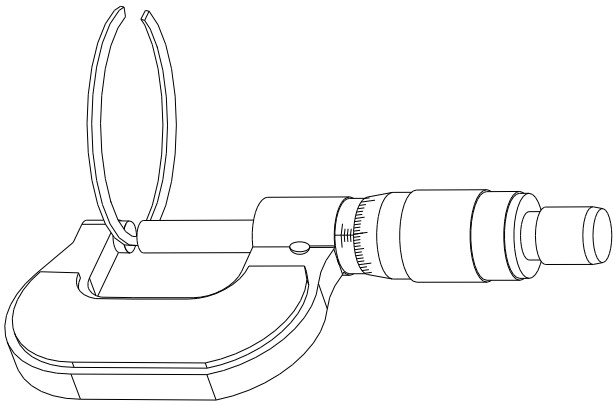
Locate the piston ring into cylinder with piston top, and measure the piston end clearance.

Standard	Service limit
0.15-0.25mm (0.006”-0.010”).	1.0mm (0.040”)



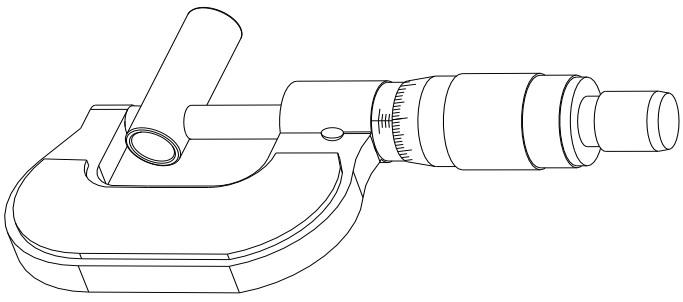
● **Piston ring height**

	Standard	Service limit
The 1st ring	1.97-1.99mm (0.0776”-0.0783”)	1.87mm (0.0736”)
The 2nd ring	1.97-1.99mm (0.0776”-0.0783”)	1.87mm (0.0736”)



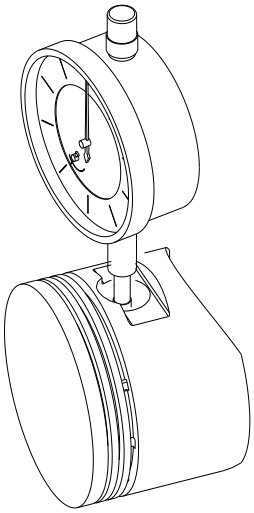
● **Piston pin outer diameter**

Standard	Service limit
17.994-18.000mm (0.7084”-0.7087”)	17.95mm (0.7067”)



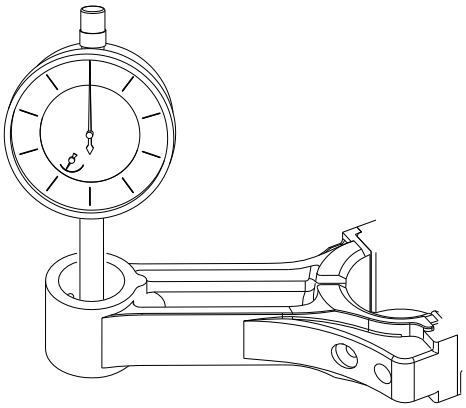
● **Piston pin hole inner diameter**

Standard	Service limit
18.002-18.008mm (0.7087”-0.7090”)	18.05mm (0.7106”)



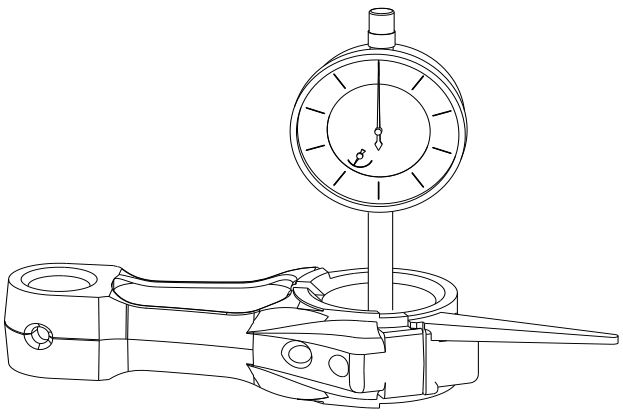
● **Connection rod small end inner diameter**

Standard	Service limit
18.006-18.017mm (0.7089”-0.7093”)	18.08mm (0.7118”)



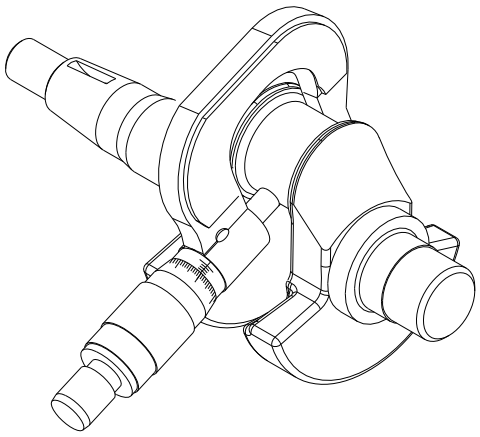
● **Connection rod big end inner diameter**

Standard	Service limit
33.020-33.033mm (1.3000”-1.3005”)	33.09mm (1.303”)



● **Crankshaft neck outer diameter**

Standard	Service limit
32.967-32.980mm (1.2979”-1.2984”)	32.90mm (1.295”)



● **Connection rod big end side clearance**

Standard	Service limit
0.1-0.4mm (0.004”-0.016”)	0.8mm (0.030”)